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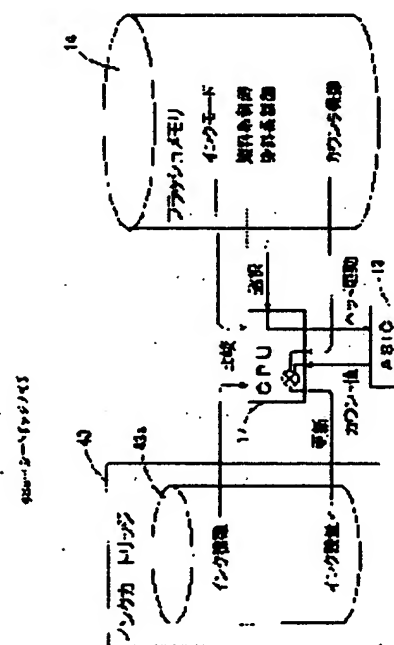
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(54) APPARATUS AND METHOD FOR CONTROLLING PRINTER, AND MEDIUM WITH PRINTER CONTROL PROGRAM RECORDED

(57)Abstract:

PROBLEM TO BE SOLVED: To solve the problem that the printing quality is damaged when different system inks mix and a residual amount of ink cannot be properly detected in a printer in which an ink type can be changed by replacing ink cartridges.

SOLUTION: The type of ink and the residual amount of ink are stored in a nonvolatile memory loaded to the ink cartridge. A type of ink is stored when the ink is supplied to an ink feed system. At a printing time, the stored type of ink is compared with the type of ink stored in the nonvolatile memory. Accordingly, printing control conforming to the types of ink when the types of ink agree can be carried out, and mixing inks can be prevented when the types of ink do not agree. Moreover, the residual amount of ink is updated by calculating the amount of ink used in accordance with driving of a head, so that a correct residual amount of ink can be detected.



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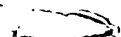
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CLAIMS

[Claim(s)]

[Claim 1] A printer control unit characterized by providing the following. Nonvolatile memory which is the printer control unit which controls a printer which prints while supplying ink with which an exchangeable ink cartridge was filled up to an arm head, and memorizes a class of ink with which the ink cartridge concerned is filled up while updating of the content of storage is possible and being carried in the above-mentioned ink cartridge The ink cartridge attachment-and-detachment section which enables data transmission and reception from the above-mentioned nonvolatile memory at the time of this ink cartridge wearing while it is removable in the above-mentioned ink cartridge A supply ink storage means to memorize a class of ink currently supplied to an ink supply system from the above-mentioned ink cartridge to the above-mentioned arm head A printing condition storage means to memorize according to a class of ink filled up with printing conditions required for actuation of the above-mentioned arm head by the above-mentioned ink cartridge in the above-mentioned printing, A class of ink memorized by a class of ink and the above-mentioned supply ink storage means which were memorized by the above-mentioned nonvolatile memory is compared. A head actuation control means which writes predetermined information in the above-mentioned nonvolatile memory suitably, controlling actuation of an arm head by the condition that a class of both ink is in agreement, based on printing conditions memorized by the above-mentioned printing condition storage means

[Claim 2] It is the printer control unit characterized by updating a residue of ink which the above-mentioned nonvolatile memory had memorized a residue of ink with which it fills up at an ink cartridge in a printer control unit given in above-mentioned claim 1, and was memorized by the above-mentioned nonvolatile memory based on the calculation concerned while the above-mentioned head actuation control means computed the amount of ink used consumed with actuation of the above-mentioned arm head.

[Claim 3] It is the printer control unit characterized by computing the amount of the ink used based on a counter which the above-mentioned head actuation control means increases with actuation of the above-mentioned arm head in a printer control unit of a publication to above-mentioned claim 2.

[Claim 4] It is the printer control unit characterized by memorizing the amount calculation coefficient of the ink used for computing the amount of the ink used by multiplying by the above-mentioned printing condition storage means in a printer control unit given in above-mentioned claim 3 at counted value of the above-mentioned counter.

[Claim 5] It is the printer control unit characterized by memorizing a driver voltage pattern impressed in case the above-mentioned printing condition storage means drives the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 4.

[Claim 6] It is the printer control unit characterized by the above-mentioned printing condition storage means memorizing actuation conditions required for cleaning of an ink supply system in the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 5.

[Claim 7] It is the printer control unit characterized by the above-mentioned printing condition storage means memorizing actuation conditions required for Flushing in the above-mentioned

arm head in a printer control unit given in either above-mentioned claim 1 - claim 6.

[Claim 8] It is the printer control unit characterized by the ability to set up so that either or combination of the above-mentioned nonvolatile memory, a supply ink storage means, and a printing condition storage means may forbid a store and elimination of storage information in a printer control unit given in either above-mentioned claim 1 - claim 7.

[Claim 9] It is the printer control unit characterized by the above-mentioned head actuation control means performing a comparison of a class of the above-mentioned ink in a printer control unit given in either above-mentioned claim 1 - claim 8 at the time of exchange of the above-mentioned ink cartridge.

[Claim 10] It is the printer control unit characterized by updating a class of ink memorized by the above-mentioned supply ink storage means after the above-mentioned head actuation control means supplies ink to the above-mentioned ink supply system in a printer control unit given in either above-mentioned claim 1 - claim 9 by class of the supplied ink concerned.

[Claim 11] A printer control method characterized by providing the following. The supply ink storage process of being the printer control method which controls a printer which prints while carrying nonvolatile memory which memorizes a class of ink with which updating of the content of storage is possible and it fills up and supplying ink with which an exchangeable ink cartridge was filled up by detaching and attaching to an applied part to an arm head, and memorizing a class of ink currently supplied to an ink supply system from the above-mentioned ink cartridge to the above-mentioned arm head A printing condition storage process memorized according to a class of ink filled up with printing conditions required for actuation of the above-mentioned arm head by the above-mentioned ink cartridge in the above-mentioned printing The head actuation control process which writes predetermined information in the above-mentioned nonvolatile memory suitably, controlling actuation of an arm head by the condition that compare a class of ink memorized by a class of ink and the above-mentioned supply ink storage process memorized by the above-mentioned nonvolatile memory, and a class of both ink is in agreement, based on printing conditions memorized by the above-mentioned printing condition storage process

[Claim 12] The printer control method characterized by to update a residue of ink which memorized a residue of ink with which the above-mentioned nonvolatile memory is filled up at an ink cartridge, and was memorized by the above-mentioned nonvolatile memory based on the calculation concerned while computing the amount of ink used consumed with actuation of the above-mentioned arm head at the above-mentioned head actuation control process in a printer control method given in above-mentioned claim 11.

[Claim 13] A printer control method characterized by computing the amount of the ink used based on a counter which increases to above-mentioned claim 12 with actuation of the above-mentioned arm head at the above-mentioned head actuation control process in a printer control method of a publication.

[Claim 14] A printer control method characterized by memorizing the amount calculation coefficient of the ink used for computing the amount of the ink used by taking the advantage of above-mentioned claim 13 at the above-mentioned printing condition storage process in a printer control method of a publication at counted value of the above-mentioned counter.

[Claim 15] A printer control method characterized by memorizing a driver voltage pattern impressed in case the above-mentioned arm head is driven at the above-mentioned printing condition storage process in a printer control method given in either above-mentioned claim 11 - claim 14.

[Claim 16] A printer control method characterized by memorizing actuation conditions required for cleaning of an ink supply system in the above-mentioned arm head at the above-mentioned printing condition storage process in a printer control method given in either above-mentioned claim 11 - claim 15.

[Claim 17] A printer control method characterized by memorizing actuation conditions required for Flushing in the above-mentioned arm head at the above-mentioned printing condition storage process in a printer control method given in either above-mentioned claim 11 - claim 16.

[Claim 18] It is the printer control method characterized by the ability to set up so that either or combination of the above-mentioned nonvolatile memory, a supply ink storage process, and a

printing condition storage process may forbid a store and elimination of storage information in a printer control method given in either above-mentioned claim 11 – claim 17.

[Claim 19] A printer control method characterized by performing a comparison of a class of the above-mentioned ink at the time of exchange of the above-mentioned ink cartridge at the above-mentioned head actuation control process in a printer control method given in either above-mentioned claim 11 – claim 18.

[Claim 20] A printer control method characterized by updating a class of ink memorized at the above-mentioned supply ink storage process after supplying ink at the above-mentioned head actuation control process in a printer control method of a publication at the above-mentioned ink supply system to either above-mentioned claim 11 – claim 19 by class of the supplied ink concerned.

[Claim 21] While carrying nonvolatile memory which memorizes a class of ink with which updating of the content of storage is possible and it fills up It is data medium which recorded a printer control program for controlling by computer a printer which prints while supplying ink with which an exchangeable ink cartridge was filled up by detaching and attaching to an applied part to an arm head. A function to read a class of ink memorized by nonvolatile memory of the above-mentioned ink cartridge, and to judge a class of ink in an ink cartridge, A function which reads a class of ink which the printer concerned beforehand indicated to nonvolatile memory carried in the above-mentioned main part of a printer is using, While comparing a class of ink by which reading appearance was carried out [above-mentioned] to a class of ink of the judged above-mentioned ink cartridge Printing conditions memorized according to a class of ink in nonvolatile memory carried in the above-mentioned main part of a printer when a class of both ink was in agreement are read. Data medium which recorded a printer control program characterized by making a computer perform a head actuation control function which writes predetermined information in nonvolatile memory of the above-mentioned ink cartridge suitably, controlling actuation of the above-mentioned arm head.

[Claim 22] It is data medium which recorded the printer control program characterized by to make the residue of the ink which had memorized the residue of the ink in which an ink cartridge is filled up with the above-mentioned nonvolatile memory in data medium which recorded a printer control program of a publication on above-mentioned claim 21, and was memorized by the above-mentioned nonvolatile memory based on the calculation concerned in the above-mentioned head actuation control function while having computed the amount of ink used consumed with actuation of the above-mentioned arm head update.

[Claim 23] Data medium which recorded a printer control program characterized by computing the amount of the ink used by the above-mentioned head actuation control function based on a counter which increases with actuation of the above-mentioned arm head in data medium which recorded a printer control program of a publication on above-mentioned claim 22.

[Claim 24] Data medium which recorded a printer control program characterized by memorizing the amount calculation coefficient of the ink used for computing the amount of the ink used by taking the advantage of counted value of the above-mentioned counter in data medium which recorded a printer control program of a publication on above-mentioned claim 23 by nonvolatile memory which memorizes the above-mentioned printing conditions according to a class of ink.

[Claim 25] Data medium which recorded a printer control program characterized by memorizing a driver voltage pattern impressed in case the above-mentioned arm head is driven in data medium which recorded a printer control program of a publication on either above-mentioned claim 21 – claim 24 by nonvolatile memory which memorizes the above-mentioned printing conditions according to a class of ink.

[Claim 26] Data medium which recorded a printer control program characterized by memorizing actuation conditions required for cleaning of an ink supply system in the above-mentioned arm head in data medium which recorded a printer control program of a publication on either above-mentioned claim 21 – claim 25 by nonvolatile memory which memorizes the above-mentioned printing conditions according to a class of ink.

[Claim 27] Data medium which recorded a printer control program characterized by memorizing actuation conditions required for Flushing in the above-mentioned arm head in data medium

which recorded a printer control program of a publication on either above-mentioned claim 21 – claim 26 by nonvolatile memory which memorizes the above-mentioned printing conditions according to a class of ink.

[Claim 28] Either or combination of nonvolatile memory carried in the above-mentioned ink cartridge and a main part of a printer in data medium which recorded a printer control program of a publication on either above-mentioned claim 21 – claim 27 is data medium which recorded a printer control program characterized by the ability to set up so that a store and elimination of storage information may be forbidden.

[Claim 29] Data medium which recorded a printer control program characterized by performing a comparison of a class of the above-mentioned ink at the time of exchange of the above-mentioned ink cartridge by the above-mentioned head actuation control function in data medium which recorded a printer control program of a publication on either above-mentioned claim 21 – claim 28.

[Claim 30] Data medium which recorded a printer control program characterized by to update a class of ink memorized in nonvolatile memory carried in the above-mentioned main part of a printer by the above-mentioned head actuation control function in data medium which recorded a printer control program of a publication on either above-mentioned claim 21 – claim 29 after supplying ink to the above-mentioned ink supply system by class of the supplied ink concerned.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to data medium which recorded the printer control unit, the printer control method, and the printer control program.

[0002]

[Description of the Prior Art] As a printer which can perform printing according to image quality equivalent to a photograph, an ink jet printer is spreading quickly in recent years. Generally in this ink jet printer, two kinds such as pigment system ink and color system ink are used. With each property, two kinds of this ink has merits and demerits in image quality, lightfastness, etc., and is widely used by both. Moreover, even if it is the case where viscosity differs from density etc. and the two above-mentioned kinds of ink uses the same arm head, in order to perform suitable printing, making it correspond to said property, control conditions, such as discharge quantity of ink and regurgitation timing, differ in pigment system ink and color system ink, respectively.

[0003]

[Problem(s) to be Solved by the Invention] The following technical problems occurred in the conventional ink jet printer mentioned above. That is, wearing of the ink cartridge of a class which makes a mistake in two kinds of ink, and is different before carrying out exchange and washing of an ink supply system also in an usable printer will mix the ink of a different system inside an ink supply system. Since it becomes impossible to perform discharge quantity control according to the property of ink etc. when two kinds of ink has been mixed, printing quality is spoiled. Therefore, in order to exchange the two above-mentioned kinds of ink and to prevent mixing of the ink in an ink supply system in an usable ink jet printer, exchange and washing of an ink supply system are needed at the time of exchange of an ink class.

[0004] Furthermore, although the residue of the ink with which the ink cartridge is filled up in the ink jet printer may be supervised and it may display as the status Before exhausting ink in the conventional ink jet printer mentioned above, from an exchangeable thing, an ink cartridge in pigment system ink and color system ink When the class of ink was changed and the class of ink was returned further once again after using ink to the middle, there was a problem that the ink residue of the original cartridge could not be judged correctly.

[0005] This invention was made in view of the above-mentioned technical problem, and even if it changes an ink cartridge what times, it aims at offering the printer control unit which can judge an ink residue correctly, the printer control method, and a printer control unit, while carrying out proper control according to an ink class, preventing mixing of the ink of a different system in the printer which can exchange an ink class.

[0006]

[Means for Solving the Problem] Invention which starts claim 1 in order to attain the above-mentioned object is constituted so that a printer which prints while supplying ink with which an exchangeable ink cartridge was filled up to an arm head may be controlled, and it is controlled, preventing mixing of an ink class. For this reason, nonvolatile memory which can update the content of storage is carried in an exchangeable ink cartridge, and a class of ink with which an

ink cartridge is filled up is memorized by this nonvolatile memory. This ink cartridge is detached and attached through an ink cartridge applied part by main part of a printer, and data transmission and reception from the above-mentioned nonvolatile memory are possible for it at the time of wearing.

[0007] Furthermore, a class of ink currently supplied to an ink supply system which consists of ink supply tubes from an ink cartridge to an arm head etc. is memorized by supply ink storage means, and printing conditions required for actuation of an arm head are memorized by printing condition storage means according to a class of ink. A head actuation control means uses such storage information in printing, and compares a class of ink memorized by a class of ink and the above-mentioned supply ink storage means which were memorized by nonvolatile memory. And actuation of an arm head is controlled based on printing conditions which drive an arm head in the condition that a class of both ink is in agreement, and suit this ink class in agreement.

[0008] Namely, a class of ink memorized by the above-mentioned nonvolatile memory is uniquely in agreement with a class of ink with which an ink cartridge was filled up. Since a class of ink memorized by supply ink storage means is uniquely in agreement with a class of ink currently supplied to an ink supply system When a head actuation control means compares these, it can prevent driving an arm head using an ink cartridge of a class of different ink from a class of ink already supplied to an ink supply system, and mixing of ink can be prevented.

[0009] Here, updating of the content of storage is possible for it, and if the above-mentioned nonvolatile memory is nonvolatile, can adopt good various modes and is constituted from EEPROMs, such as a flash memory, it is suitable. Moreover, although what is necessary is just to memorize whether a class of ink is the thing of whether restoration ink is the thing of a color system as information which is used in order to prevent mixing of ink as mentioned above, and for that shows a class of ink, and a pigment system, it is possible to memorize various information in addition to this as a class of ink. That is, by referring to the restoration day concerned, if a restoration day of ink is memorized, it can constitute so that ink over which the expiration date passed may not be used. Moreover, even if it is ink of a same system, actuation of an arm head is controllable by the best actuation sequence over the ink by memorizing information which shows a purport from which a component differs.

[0010] It is removable in an ink cartridge, and the ink cartridge attachment-and-detachment section equips a holder of a fitting type with a container which has capacity which can be filled up with ink that what is necessary is just to be able to enable data transmission and reception from nonvolatile memory at the time of ink cartridge wearing, and a configuration which secures a flow of a terminal of nonvolatile memory to fitting concerned and coincidence is possible for it. It can constitute from rewritable various memory that what is necessary is just to be able to memorize a class of ink currently supplied to an ink supply system in a supply ink storage means. Although RAM etc. can constitute, if a printer is frequently constituted from EEPROMs, such as a flash memory, a place whose power supply is what is turned on / turned off, it is suitable.

[0011] It can constitute from various memory that what is necessary is just to be able to memorize according to a class of ink filled up with printing conditions required for actuation of an arm head by the above-mentioned ink cartridge in a printing condition storage means. Although a mask ROM etc. can also constitute, the status changes with activities serially, and since it is the mode which can change activity ink, if especially this invention is constituted from EEPROMs, such as a rewritable flash memory, it is suitable [this invention] for a printer. If a head control driving means is constituted from a CPU etc., it is [that what is necessary is to read and calculate information from various memory etc. and just to be able to control memory, an arm head, etc.] suitable.

[0012] As a configuration for controlling to be able to judge an ink residue correctly, furthermore, invention according to claim 2 In a printer control unit given in above-mentioned claim 1 the above-mentioned nonvolatile memory A residue of ink with which an ink cartridge is filled up is memorized, and the above-mentioned head actuation control means is considered as a configuration which updates a residue of ink memorized by the above-mentioned nonvolatile memory based on the calculation concerned while it computes the amount of ink used consumed with actuation of the above-mentioned arm head.

[0013] That is, since a residue of ink is updated with actuation of a printer, it becomes the residue of proper ink. Since a residue of ink is memorized by nonvolatile memory carried in the ink cartridge itself, it removes, before consuming ink with which it filled up, other ink cartridges are used, and an ink residue will become proper even if it uses an ink cartridge removed again. of course, -- even if it uses it, removing an ink cartridge and making other printers equip -- being concerned -- others -- if a printer control unit which requires a printer for this invention is provided, it will become a proper ink residue.

[0014] Moreover, the technique of computing the amount of ink used by head actuation control means is various, and invention according to claim 3 is considered as a configuration which computes the amount of the ink used based on a counter which the above-mentioned head actuation control means increases with actuation of the above-mentioned arm head in a printer control unit given in above-mentioned claim 2 as an example of a configuration for it. That is, since an arm head drives at the time of printing, if a counter which counted value increases with actuation of the arm head concerned is used, based on the counted value concerned, the amount used is easily computable. The technique of more specifically counting the number of dots which carries out the regurgitation by arm head is employable. What is necessary is just to compute the amount used for every class of ink based on the number of dots, although the amount used may change with classes of ink also with the same number of dots since a class of ink can be changed in this invention. Thus, when computing the amount of ink used based on counted value, especially this count should just form a single counter, without distinguishing according to a class of ink.

[0015] As an example of printing conditions which various conditions exist as printing conditions required for actuation of the above-mentioned arm head, and need to be memorized according to a class of ink, furthermore, invention according to claim 4 In a printer control unit given in above-mentioned claim 3, the above-mentioned printing condition storage means is considered as a configuration which memorizes the amount calculation coefficient of the ink used for computing the amount of the ink used by taking an advantage at counted value of the above-mentioned counter.

[0016] That is, since above-mentioned counted value and the amount of ink used are usually in proportionality, if the amount calculation coefficient of the ink used which computes the amount of the ink used by taking the advantage of counted value is prepared, the amount used can be easily obtained from counted value only by 1 time of multiplication. Moreover, it can constitute very easily [that the amount coefficient of the ink used for every class of ink may only be memorized], and in order to compute the amount used for every class of ink, also when it is necessary to correspond to ink in which a class of ink increases or properties differ, it can respond easily.

[0017] Furthermore, invention according to claim 5 is considered as a configuration which memorizes a driver voltage pattern impressed in case the above-mentioned printing condition storage means drives the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 4 as other examples of printing conditions which need to be memorized according to a class of ink. That is, when classes of ink differ like ink of a pigment system, and ink of a color system, conditions which drive an arm head differ. For example, if the above-mentioned ink classes differ in the case of a printer which controls discharge quantity, regurgitation timing, etc. of ink by telescopic motion of a piezo-electric element etc., 1 time of ink discharge quantity differs from regurgitation timing etc. Since it is controlled by changing a driver voltage pattern impressed to an arm head, such discharge quantity etc. can perform printing according to a class of ink easily, if a driver voltage pattern is memorized according to a class of ink as printing conditions.

[0018] Furthermore, invention according to claim 6 is considered as a configuration which memorizes actuation conditions which the above-mentioned printing condition storage means needs for cleaning of an ink supply system in the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 5 as other examples of printing conditions which need to be memorized according to a class of ink. Namely, since an ink supply system may be cleaned, ink is once discharged in this case and wiping etc. is carried out when a case where

a printer is not used for a long time, and printing quality have deteriorated, in order to make blowdown perform exactly, it is necessary to drive an arm head a condition for every class of ink, and, in such a case, can respond.

[0019] Furthermore, since a class of ink can be exchanged in this invention, it is necessary to also wash an ink supply system from a cartridge to an arm head on the occasion of exchange, and when performing this washing sequence, in order to make ink of an ink supply system discharge exactly, it is necessary to drive an arm head a condition for every class of ink, and, also in such a case, can respond.

[0020] Furthermore, invention according to claim 7 is considered as a configuration which memorizes actuation conditions which the above-mentioned printing condition storage means needs for Flushing in the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 – claim 6 as other examples of printing conditions which need to be memorized according to a class of ink. Namely, although Flushing may be performed in order to carry out regurgitation blowdown of the color mixture ink which flowed backwards from a nozzle by wiping or to prevent blinding by thickening of ink, from it being what should be determined with the property of an ink class, timing which performs this Flushing, and a regurgitation discharge at the time of Flushing need to drive an arm head a condition for every class of ink, in order to perform Flushing exactly, and, in such a case, can respond.

[0021] Furthermore, when a power supply of a printer is turned off suddenly, mixing of ink is prevented after re-powering on. As an example for judging an ink residue appropriately and constituting it possible [activation of head actuation for every class of ink] exactly, invention according to claim 8 In a printer control unit given in either above-mentioned claim 1 – claim 7, either or combination of the above-mentioned nonvolatile memory, a supply ink storage means, and a printing condition storage means is considered as a configuration which can be set up so that a store and elimination of storage information may be forbidden.

[0022] That is, if a store and elimination of storage information can be forbidden, when a case where a power supply was turned off suddenly and a power supply becomes instability, and a noise increase, required storage information is not updated and a printer can be driven in the original condition after re-powering on. For example, since storage information on a supply ink storage means is still origin, in spite of having already supplied ink after re-powering on at an ink supply system, it is going to perform supply of further different ink and ink is not mixed. Moreover, an arm head is not driven using ink currently supplied to an ink supply system, and different ink. Furthermore, when a power supply becomes instability, information for computing the above-mentioned amount of the ink used is memorized for a printing condition storage means etc., and if an ink residue is updated based on the memorized amount of the ink used concerned after a power supply is stable, a more exact ink residue can be obtained. Here, as a flume which forbids a store and elimination of storage information, when storage information needs to be updated of course, it updates by canceling a prohibition condition of a store and elimination.

[0023] Furthermore, invention according to claim 9 is considered as a configuration in which the above-mentioned head actuation control means performs a comparison of a class of the above-mentioned ink at the time of exchange of the above-mentioned ink cartridge in a printer control unit given in either above-mentioned claim 1 – claim 8 as an example of a configuration for controlling to prevent mixing of ink in the above-mentioned head actuation control means. That is, a printer concerning this invention is considered [mistaking a class of ink in many cases at the time of this exchange since it is exchangeable, and] in an ink cartridge, and can prevent mixing of ink certainly by performing the above-mentioned comparison at the time of this exchange. It constitutes so that various modes can be adopted in order to detect exchange of an ink cartridge here, for example, it may remove with the time of wearing of an ink cartridge and a predetermined signal may sometimes be outputted, and when a signal which shows wearing is detected, it can constitute so that a comparison may be performed.

[0024] Furthermore, invention according to claim 10 has considered [as an example of the configuration for preventing mixing of ink in the above-mentioned head actuation control means] as the configuration which updates at a class of the supplied ink concerned in a class of ink

memorized by the above-mentioned supply ink storage means in a printer control unit given in either above-mentioned claim 1 - claim 9, after the above-mentioned head actuation control means supplies ink to the above-mentioned ink supply system.

[0025] That is, since a printer concerning this invention can change suitably a class of ink used by exchange of a cartridge, in case it changes a class of the ink concerned, it will also wash ink currently supplied to the above-mentioned ink supply system, and will newly be resupplied. Then, if a class of ink memorized by supply ink storage means by head actuation control means after supply of ink to an ink supply system is updated, an arm head can be driven using always proper ink by the comparison of a class of the above-mentioned ink, even if it carries out the message exchange of ink what times, and mixing of ink can be prevented.

[0026] Thus, while memorizing a class of ink, and a residue of ink to nonvolatile memory carried in an ink cartridge and preventing mixing of ink with reference to these, the technique of grasping a residue of ink proper does not necessarily need to be restricted to equipment with substance, and functioning also as the method can be understood easily. For this reason, invention concerning claim 11 - claim 20 is considered as a configuration corresponding to a control method which said printer control unit enforces. That is, there is no difference not only in equipment which not necessarily has substance but in being effective as the method.

[0027] By the way, such a printer control unit contains not only this but various kinds of modes as thought of that it may be used in the condition of existing independently and having been included in a certain device, and invention. Therefore, it can change suitably that it is software or hardware etc. When becoming the software of a printer control unit as an example of embodiment of thought of invention, naturally it exists on a record medium which recorded this software, and it must be said that it is used. Invention which starts claim 21 - claim 30 in the semantics is considered as a configuration corresponding to each step which makes said printer control unit carry out by computer.

[0028] of course, the record medium may be magnetic-recording data medium, may be magneto-optic-recording data medium, and can completely be considered the same way in any record media developed from now on. Moreover, about duplicate phases, such as a primary replica and a secondary replica, it is equivalent without room to completely ask. If above-mentioned data medium is the case where it carries out as the supply method using a communication line although it differs, a communication line serves as a transmission medium and this invention will be used.

[0029] Furthermore, a part is software, when a part is realized by hardware, there is nothing that is completely different in thought of invention, and it may be made into a thing of a gestalt which memorizes a part on a record medium and is read suitably if needed. Moreover, when carrying out this invention by software, it not only realizes as data medium by which invention recorded a program, but naturally this invention is realized as the program itself, and the program itself is included in this invention.

[0030]

[Effect of the Invention] According to invention which starts claim 1, claim 11, and claim 21 as explained above, mixing of ink can be prevented, and data medium which recorded the printer control unit which can perform suitable control according to the class of ink, the printer control method, and the printer control program can be offered.

[0031] Moreover, according to invention concerning claim 2, claim 12, and claim 22, the proper ink residue in an ink cartridge can be judged. Furthermore, according to invention concerning claim 3, claim 13, and claim 23, the amount of the ink used is easily computable. Furthermore, according to invention concerning claim 4, claim 14, and claim 24, the configuration for computing the amount used for every class of ink can be realized easily, and the amount used can be easily obtained from counted value. Furthermore, according to invention concerning claim 5, claim 15, and claim 25, printing according to the class of ink can be performed easily.

[0032] Furthermore, according to invention concerning claim 6, claim 16, and claim 26, it can clean the condition for every class of ink. Furthermore, according to invention concerning claim 7, claim 17, and claim 27, Flushing can be performed the condition for every class of ink.

Furthermore, according to invention concerning claim 8, claim 18, and claim 28, when the power

supply of a printer is turned off suddenly, mixing of ink can be prevented after re-powering on, an ink residue can be judged appropriately, and head actuation for every class of ink can be performed exactly. Furthermore, according to invention concerning claim 9, claim 19, and claim 29, mixing of ink can be prevented certainly. Furthermore, according to invention concerning claim 10, claim 20, and claim 30, mixing of ink can be prevented certainly.

[0033]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing 1 is the outline perspective diagram showing the internal configuration of the ink jet printer carrying the printer control unit concerning 1 operation gestalt of this invention, and drawing 2 is the block diagram showing the connection condition of each hardware of the ink jet printer concerned. In drawing, it has the Maine substrate 11 and the printing section 20, the panel section 30, and the cartridge section 40 are connected to the Maine substrate 11, and an ink jet printer 10 functions as a printer, when CPU12 which it had on the Maine substrate 11 controls each part.

[0034] On the Maine substrate 11, it has others, ASIC13, a flash memory 14, and the head actuator 16. [above / CPU 12] ASIC13 is IC customized since the arm head 22 mentioned later was driven, and it performs processing for head 22 actuation, transmitting and receiving the above CPU 12 and a predetermined signal. As one of the processing of this, it has the amount counter of the ink used, and the number of dots printed is counted for every ink color. In addition, the applied-voltage data to the head actuator 16 which mentions later is outputted. The head actuator 16 generates the applied-voltage pattern to the piezo-electric element built in the arm head 22 which is the circuit which consists of Dedication IC, a transistor for actuation, a heat sink, etc., and is mentioned later.

[0035] A flash memory 14 is EEPROM which can eliminate the content of storage electrically, and can eliminate data per a chip package or block. Furthermore, the flash memory 14 concerning this operation gestalt is a boot block mold, and can forbid the store and elimination of hardware-data to a predetermined block.

[0036] The printing section 20 is mainly equipped with the roller 21 and the arm head 22, and the arm head 22 is connected with the above-mentioned Maine substrate 11 through the predetermined trunk cable. Rotating by the motor which is driven by the motor control section which is not illustrated and which is not illustrated, the roller 21 is constituted so that a print sheet may be sent. while the arm head 22 is carried in the carriage which is not illustrated and this carriage makes an arm head 22 arrange near the periphery of the above-mentioned roller 21 -- an arm head 22 -- the shaft orientations of a roller 21 -- a round trip -- it is made movable.

[0037] Tube 22a of each ink color exception is connected to the arm head 22, and supply of each color ink is received. Moreover, the arm head 22 is equipped with the piezo-electric element which is not illustrated, and when a piezo-electric element drives at the ink room which is open for free passage from above-mentioned tube 22a to a delivery, the regurgitation of the ink is carried out per dot. The wiring on a predetermined trunk cable and a substrate connects, and this head actuator 16 impresses this generation voltage to an arm head 22 while generating predetermined voltage according to the command from the above ASIC 13, and as for an arm head 22 and the head actuator 16, it drives the above-mentioned carriage and a piezo-electric element.

[0038] The panel section 30 is equipped with the liquid crystal display object 31 and the manual operation button 32, and the panel section 30 is connected with the above-mentioned Maine substrate 11 by the predetermined trunk cable through panel I/O33. The liquid crystal display object 31 is a display which displays an alphabetic character etc. based on the predetermined signal transmitted from CPU12, and can display an error message, the status, etc. A manual operation button 32 is a carbon button used in case a user and a serviceman operate an ink jet printer 10, and by independent carbon button pushing actuation or two or more carbon button pushing actuation, the above CPU 12 distinguishes the content of actuation, and can direct now ON/OFF of a power supply, blowdown of print data, discharge of an error message, activation of the ink message exchange, activation of cleaning, etc.

[0039] The cartridge section is mainly equipped with the sub substrate 41, the cartridge holder

42, and the ink cartridge 43. The ink jet printer 10 concerning this operation gestalt uses cyanogen, a Magenta, yellow, light cyanogen, a light Magenta, and six colors of black, and fills up an ink cartridge 43 with each ink. The ink cartridge carries cartridge memory 43a, and the class of ink and the residue of ink with which it fills up are memorized by this cartridge memory 43a. Here, the data in which it is shown whether it is color system ink as a class of ink or it is pigment system ink is recorded. That is, this cartridge memory 43a constitutes the above-mentioned nonvolatile memory. Each cartridge holder 42 is equipped with contact section 42a with cartridge memory 43a, if the cartridge holder 42 is equipped with an ink cartridge 43, will contact cartridge memory 43a and will secure the connection for data transmission and reception. Moreover, the above-mentioned cartridge holder 42 is equipped with the ink supply needle which is not illustrated, if equipped with an ink cartridge 43, will contact the ink feed hopper with which this ink cartridge 43 is equipped and which is not illustrated, and will form the supply path of ink. The ink with which tube 22a was attached in the cartridge holder 42, and it filled up in the ink cartridge 43 through this tube 22a is supplied to the above-mentioned arm head 22.

[0040] It is carried in an ink jet printer 10 by equipping the cartridge holder 42 with each ink cartridge 43, and where the cartridge holder 42 is equipped, while ink supply is attained through the above-mentioned tube 22a, transmission and reception of data of the above-mentioned cartridge memory 43a are attained. That is, the predetermined trunk cable 40 is connected to the cartridge holder 42, and where the cartridge holder 42 is equipped with an ink cartridge 43, the communication line of the trunk cable 40 concerned and cartridge memory 43a is secured. Thus, in this operation gestalt, the cartridge holder 42 constitutes the above-mentioned applied part.

[0041] The above-mentioned cartridge memory 43a is controlled by transmitting and receiving a predetermined signal from control IC41a which the trunk cable 40 connected to the cartridge holder 42 was connected to the sub substrate 41, and was carried on this sub substrate 41. The sub substrate 41 is connected to the above-mentioned Maine substrate 11 through the further predetermined trunk cable. The above-mentioned control IC41a is IC carried in order to control using two or more ink, i.e., two or more cartridge memory 43a, and performs read-out of the class of ink recorded on cartridge memory 43a, renewal of an ink residue, etc. by CPU12 on the Maine substrate transmitting and receiving a predetermined signal, and performing control IC41a and a communication link. Moreover, in this operation gestalt, in order to distinguish whether attachment and detachment of an ink cartridge 43 were performed, when the above-mentioned control IC41a outputs the signal which shows removal of an ink cartridge 43 when an ink cartridge 43 is removed from the cartridge holder 42 and it is equipped with an ink cartridge 43, the above-mentioned control IC41a outputs the signal which shows wearing of an ink cartridge 43.

[0042] On the above-mentioned Maine substrate 11, it has further predetermined communication link I/O15, and connects with the computer 50 of the exterior of an ink jet printer 10 through this communication link I/O15. If the driver for this ink jet printer 10 is installed in the computer 50 and a user performs printing of digital photograph data, while a driver will perform predetermined data conversion etc., print data and printing directions are transmitted to an ink jet printer 10, and the above CPU 12 prints print data according to printing directions.

[0043] Drawing 3 shows the important section of the memory map of a flash memory 14. Since the both sides of the ink of a color system and the ink of a pigment system are usable, in order that they may perform suitable control to the ink of both systems in a flash memory 14, as for the ink jet printer 10 concerning this operation gestalt, the parameter according to system of ink etc. is memorized. The initial flag which shows whether initial restoration filled up with predetermined ink in an ink supply system, i.e., the above-mentioned tube 22a, was specifically performed, and the ink mode which shows the class of ink current in use are memorized.

[0044] Furthermore, the printing conditions which are an actuation parameter according to class of ink are memorized to each of the ink of a pigment system, and the ink of a color system. These data is memorized by the protection block which can forbid the store and elimination of hardware-data. Thus, in this operation gestalt, a flash memory 14 constitutes the above-

mentioned supply ink storage means and a printing condition storage means. There are a counter coefficient, driver voltage, cleaning conditions, and the Flushing conditions as printing conditions, and a counter coefficient is a coefficient by which the counted value in the above ASIC 13 is multiplied, and computes appropriately the amount of the ink used of both a pigment system and a color system from a unified count which is called the number of dots by the multiplication concerned. Moreover, since the ink of a pigment system differs from the ink of a color system, the property, i.e., the viscosity etc., of ink etc., though same actuation of the regurgitation of ink, cleaning, Flushing, etc. is carried out, concrete actuation of an arm head 22 differs.

[0045] Then, driver voltage, cleaning conditions, and the Flushing conditions are memorized for every system, and CPU12 reads this data and directs it to the above ASIC 13, and when the head actuator 16 carries out predetermined head actuation according to the directions concerned, suitable control is performed to the ink of both systems. For example, driver voltage is data in which the pattern of the applied voltage generated in the above-mentioned head actuator 16 at the time of printing is shown, and impresses voltage by pattern which is different as shown in drawing 4.

[0046] That is, if the driver voltage as printing conditions consists of a look-up table which indicated timer data and CPU12 directs to ASIC13 with reference to this lookup data, ASIC13 will change the timer data concerned and will output applied-voltage data to the head actuator 16. The head actuator 16 generates the pulse which is the temporal response of voltage with said applied-voltage data. While a pulse mainly has a lifting pulse and a downward pulse and applied voltage rises in a lifting pulse, the above-mentioned piezo-electric element drives, and the capacity of an ink room decreases. Moreover, while applied voltage descends in a downward pulse, the above-mentioned piezo-electric element drives, and the capacity of an ink room increases. Therefore, by adjusting the width of face of these pulses, the voltage which the above-mentioned head actuator 16 generates becomes abbreviation trapezoidal shape as shown in drawing 4, and the regurgitation of ink is controlled by this voltage.

[0047] The voltage pattern of this drawing 4 upside is the thing of a pigment system, inputs a downward pulse in a period t11 first, and makes the capacity of an ink room increase in the ink of the pigment system concerned. And after falling and making the condition of ink attach by suspending the input of a pulse in a period t12, and holding a piezo-electric element, a lifting pulse is inputted, the capacity of an ink room is decreased, and ink is made to breathe out in a period t13. Furthermore, the input of a pulse is suspended in a period t14, this condition is held, a downward pulse is inputted in a period t15, and regurgitation ink is divided. Then, while suspending the input of a pulse in a period t16 and carrying out fixed period maintenance of this condition, carriage is driven and the ink regurgitation sequence over the following dot is performed.

[0048] On the other hand, the voltage pattern of the drawing 4 bottom is the thing of a color system, in the ink of the color system concerned, inputs a lifting pulse in a period t21 first, and decreases the capacity of an ink room. And after falling and making the condition of ink attach by suspending the input of a pulse in a period t22, and holding a piezo-electric element, this condition is held in a period t24, it falls and the condition of ink is made to input a downward pulse, to make the capacity of an ink room increase, and to attach in a period t23. Furthermore, a lifting pulse is inputted again, the capacity of an ink room is decreased, and ink is made to breathe out in a period t25. This condition is held in next in a period t26, a downward pulse is inputted into it in a period t27, regurgitation ink is divided, this condition is held in a period t28, and the regurgitation sequence of 1 dot is ended.

[0049] Thus, in the ink of a pigment system, and the ink of a color system, head actuation patterns also differ from the difference in an ink property, in order to perform control suitable for each system, driver voltage is held according to the ink system, and according to the class of ink, it is referred to suitably. Besides the driver voltage at the time of this printing, it is generable [the head actuator 16 / the voltage for cleaning or Flushing], and an arm head 22 can perform the regurgitation of the ink which is unrelated to printing with the voltage concerned. That is, on the other hand, the pump unit 24 is arranged directly under the edge, and attraction of thickening ink and initial restoration processing to tube 22a can be performed by making negative pressure

act to the arm head 22 of a reciprocating motion of an arm head 22 conveyed to this pump-unit location.

[0050] The head actuator 16 impresses predetermined driver voltage to a pump unit 24 through the cable which is not illustrated. If fixed time amount passes during printing, the Flushing conditions according to the class of ink will be referred to. An arm head 22 is made to perform the predetermined ink regurgitation, and while referring to the cleaning conditions according to an ink class according to the predetermined actuation in the above-mentioned manual operation button 32, predetermined cleaning actuation can be performed on an arm head 22. Furthermore, after exchange of an ink cartridge, initial restoration processing to tube 22a is performed.

[0051] Drawing 5 is the schematic diagram having shown the outline of the control which the printer control unit applied to this invention in the above-mentioned configuration carries out. In order for the above CPU 12 to bear the main control in the printer control unit and to perform processing according to the class of ink, CPU12 compares the ink mode memorized by the class and flash memory 14 of the ink memorized by the above-mentioned cartridge memory 43a. It prints in the condition of having made in agreement the class of ink in which under the current activity memorized as ink mode (i.e., an ink supply system) is filled up with ink, and the class of ink with which the ink cartridge 43 is filled up.

[0052] Moreover, since an arm head 22 is driven on the conditions which suited the class of ink it was presupposed that it was in agreement of ink with these comparisons, with reference to a flash memory 14, an arm head 22 is driven using the parameter of pigment system control or color system control according to the class of ink current in use. Furthermore, by updating it from the ink residue of the above-mentioned cartridge memory 43a, as the amount used concerned is reduced, while computing the amount of the ink used by multiplying the number of dots counted by ASIC13 by the counter coefficient according to the class of ink, even if it is pigment system ink and is color system ink, the ink residue is memorized to accuracy. Thus, in this operation gestalt, CPU12, ASIC13, the head actuator 16, and control IC41a constitute the above-mentioned head actuation control means.

[0053] Drawing 6 -8 show the flow chart of the processing which CPU12 performs with an ink jet printer 10 including the above control. Drawing 6 is processing performed after boot of an ink jet printer 10, and CPU12 distinguishes whether the above-mentioned initial flag is ON with reference to a flash memory 14 at step S100. Processing for being filled up with ink in the tube 22a concerned is performed noting that ink supply systems, such as above-mentioned tube 22a, are not filled up with ink, when it is not distinguished at this step S100 that an initial flag is ON.

[0054] At this time, in step S105, CPU12 performs the above-mentioned control IC41a and a communication link, carries out reading appearance of the ink class of cartridge memory 43a to this control IC41a, and grasps the class of ink of six colors each. At step S110, it distinguishes whether the class of this read ink is the same class also as six colors, when it is not distinguished that it is the same class, the panel section 30 is controlled by step S115 through above-mentioned panel I/O33, and the error message A shown in the liquid crystal display object 31 at drawing 9 is displayed.

[0055] An error message A is a message "six colors of cartridges are not unified", and the processing after the above-mentioned step S105 is repeated, urging exchanging the ink cartridge 43 which the user was mistaken in and was inserted where the message concerned is displayed to a proper thing. When the class of ink is distinguished at the above-mentioned step S110 as it is the same class also as six colors, restoration processing of ink to an ink supply system is performed at step S120. The restoration processing concerned is a special sequence which makes an ink supply system fill up with ink, after this sequence is performed, an ink supply system is filled up with the ink in an ink cartridge, and the ink interior of a room of an arm head 22 is also filled up with ink. Therefore, if the piezo-electric element in an arm head 22 is driven in this condition, ink will be breathed out from the nozzle of an arm head 22.

[0056] After this restoration processing, the class of ink which accessed the above-mentioned flash memory 14 at step S125, and carried out [above-mentioned] restoration is set up as ink mode. Furthermore, the above-mentioned flash memory 14 is accessed at step S130, and the above-mentioned initial flag is set. When it is distinguished at the case where such restoration

processing is performed, and the above-mentioned step S100 that an initial flag is ON, while accessing the above-mentioned flash memory 14 at step S135 and reading the above-mentioned ink mode, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S140, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped.

[0057] And it distinguishes whether the ink mode memorized by the class and flash memory 14 of the ink filled up with step S145 into the ink cartridge 43 is in agreement. When both were in agreement at step S145 and it is distinguished, printing processing is performed at step S200. If both are in agreement at step S145, when not being distinguished, the panel section 30 is controlled by step S150 through above-mentioned panel I/O33, and the error message B shown in the liquid crystal display object 31 at drawing 10 is displayed.

[0058] An error message B is a message of "being equipped with the ink in which ink modes differ", and the processing after the above-mentioned step S140 is repeated, urging exchanging the ink cartridge 43 which the user was mistaken in and was inserted where the message concerned is displayed to a proper thing. Processing which is standing by and shows that print-data transmission is carried out with printing directions from the above-mentioned computer 50 in printing processing of step S200 to drawing 7 after printing directions is performed.

[0059] At step S205, the above ASIC 13 is accessed, a counter is cleared to "0" at the amount step S210 of the ink used in this ASIC13, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S210, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped. And a flash memory 14 is accessed at step S215, and the printing conditions which suited the class of the ink concerned are read.

[0060] Printing is performed driving a part for a predetermined line based on the print data transmitted from the above-mentioned computer 50 after step S220. At step S220, with reference to the driver voltage of the printing conditions which suited the class of the above-mentioned ink, a command is transmitted to the above ASIC 13, and an arm head 22 is driven by making the head actuator 16 output the above-mentioned pulse. Thus, an arm head 22 is driven, and at step S225, the count is performed by ASIC13, moving an arm head 22 by carriage and performing printing.

[0061] after printing for a predetermined line is completed, reading appearance of the counter coefficient which accessed the flash memory 14 at step S230, and suited the class of ink is carried out, and the amount of the ink used is computed by multiplying by the counter coefficient concerned which carried out reading appearance and the counted value of the above ASIC 13 at step S235. As the amount of the ink used which computed the command at this step S235 from delivery and the ink residue memorized at cartridge memory 43a is reduced to the above-mentioned control IC41a, it is made to update the ink residue concerned at step S240. In step S245, the above ASIC 13 is accessed and a counter is again cleared to "0" at the amount step S210 of the ink used in this ASIC13.

[0062] And the processing after the above-mentioned step S220 is repeated until it distinguishes that it was finished whether printing all the print data transmitted from the above-mentioned computer 50 in step S250 and having finished printing is distinguished. In addition, in one end position of a reciprocating motion according [the above-mentioned arm head 22] to carriage, Flushing is made with this operation gestalt. That is, after fixed time amount passes during printing, an arm head 22 is conveyed even to the Flushing field, and Flushing is performed, reading the Flushing conditions which suit the class of ink read from the flash memory 14 at the above-mentioned step S210. Moreover, when an ink cartridge 43 is removed in this operation gestalt, in order to prevent continuing performing printing, when the signal which control IC41a outputs when the above-mentioned ink cartridge 43 is removed is detected, processing which interrupts processing of steps S205-S250 of drawing 7 , and is shown in drawing 8 is performed.

[0063] If the signal which shows that the ink cartridge 43 was removed is detected, the panel section 30 will be controlled by step S305 through above-mentioned panel I/O33, and the error message C shown in the liquid crystal display object 31 at drawing 11 will be displayed. An error message C is a message "equip with a cartridge", and the processing after the above-mentioned

step S305 is repeated until the signal which shows that it equipped with the ink cartridge 43 at step S310 is detected a user urging equipping with an ink cartridge 43 where the message concerned is displayed. If the signal which shows that it equipped with the ink cartridge 43 at step S310 is detected, while accessing the above-mentioned flash memory 14 at step S315 and reading the above-mentioned ink mode, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S320, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped.

[0064] And it distinguishes whether the ink mode memorized by the class and flash memory 14 of the ink filled up with step S325 into the ink cartridge 43 is in agreement. If both are in agreement at step S325, when not being distinguished, the panel section 30 is controlled by step S330 through above-mentioned panel I/O33, and the error message B shown in the liquid crystal display object 31 at drawing 10 is displayed. when both were in agreement at step S325 and it is distinguished, reading appearance of the counter coefficient which accessed the flash memory 14 at step S325, and suited the class of ink is carried out, and the amount of the ink used is computed by multiplying by the counted value currently held at step S340 by the counter coefficient which carried out reading appearance and Above ASIC 13 concerned.

[0065] As the amount of the ink used which computed the command at this step S340 from delivery and the ink residue memorized at cartridge memory 43a is reduced to the above-mentioned control IC41a, it is made to update the ink residue concerned at step S345. That is, after the restoration ink of an ink cartridge 43 with which it is re-equipped judges whether it is the right, an ink residue is updated based on the counted value counted until the cartridge was extracted. Therefore, even if it is the case where an ink cartridge 43 is in the middle of printing, and is removed, it becomes a right ink residue. Then, it returns to the printing processing shown in above-mentioned drawing 7.

[0066] Furthermore, in this operation gestalt, it is usable in the both sides of the ink of a pigment system, and the ink of a color system, and the class of the ink concerned can be changed. On the occasion of exchange of an ink system, if the ink of both systems is mixed, in a print, it will not become suitable coloring, and various inconvenience arises from the actuation patterns of head 22 grade differing. Therefore, on the occasion of exchange of an ink system, it is necessary to also carry out washing of the above-mentioned ink supply system. When a user or a serviceman performs predetermined pushing actuation with the manual operation button 32 of the above-mentioned panel section 30, it is possible to carry out the message exchange of ink.

[0067] That is, if predetermined pushing actuation is performed in the above-mentioned manual operation button 32, the predetermined trigger according to the actuation concerned will be outputted, and if CPU12 receives the trigger concerned, even if printing will perform, the message exchange shown in step S400 of drawing 6 is performed. Expressing a predetermined guidance message on the liquid crystal display object 31 of the above-mentioned panel section 30 as step S410 in this message exchange, it is made to equip with the cartridge by which the penetrant remover went into the cartridge holder 42, and the washing sequence over an ink supply system is performed. Since the ink supply system of an ink jet printer 10 of after this washing processing is the same as that of an off, a new condition and a new EQC, i.e., an initial flag, condition, processing after the above-mentioned step S105 is performed.

[0068] Furthermore, if cleaning actuation which washes the arm head 22 other than the washing processing at the time of this ink system modification can be performed and predetermined pushing actuation is performed with the manual operation button 32 of the above-mentioned panel section 30 If the predetermined trigger according to the actuation concerned is outputted and CPU12 receives the trigger concerned The wiping member which CPU12 becomes from elastic plates, such as rubber, after it discharges directions by delivery and it makes the head actuator 16 discharge ink with negative pressure through the above ASIC 13 performs wiping actuation on the front face of head.

[0069] Hereafter, the example of operation performed with this operation gestalt by the above-mentioned configuration and the processing flow is explained. Drawing 12 shows the signal outputted when the content and cartridge in ink mode which are memorized by the class and flash memory 14 of the ink with which it filled up in each ink cartridge 43 are removed, and the

counted value in ASIC13 by the timing chart. Suppose that the ink cartridge of the ink of a pigment system, yellow (Y), and a light Magenta (LM) is filled up with the ink of a color system at the ink cartridge of cyanogen (C), a Magenta (M), black (K), and light cyanogen (LC) as an initial state in this example of operation.

[0070] In this condition, if an ink jet printer 10 is booted, processing shown in above-mentioned drawing 6 is performed, and it distinguishes whether an initial flag is ON at step S100, and read-out of the ink class in step S105 and distinction in step S110 will be performed noting that an initial flag is not ON. Here, since the thing of a pigment system and the thing of a color system are intermingled, the ink with which the ink cartridge is filled up displays an error message A on the liquid crystal display object 31 in step S115 through distinction of step S110.

[0071] A user grasps that the class of ink is intermingled by checking this error message A by looking, and he equips with the ink cartridge of the yellow with which the ink of a pigment system was filled up, and a light Magenta while he removes the ink cartridge of the above-mentioned yellow and a light Magenta at time of day t1. Consequently, it will distinguish, if the ink of the same class is filled up with step S110 into all ink cartridges, initial restoration to an ink supply system is performed at step S120, and while setting ink mode as a flash memory 14 as a pigment system at step S125, an initial flag is set at step S130.

[0072] Furthermore, the class of ink may be mistaken, when the initial flag is turned on and an ink jet printer 10 is conveyed, and an ink cartridge 43 is once removed and it equips with it again. For example, suppose that it equipped with the ink cartridge 43 into which the ink of a color system was filled up with time of day t2, and the ink jet printer 10 was booted after carrying out the above-mentioned initial restoration.

[0073] In this case, if the initial flag is turned on at step S100, after distinguishing, the purport whose ink mode memorized by the flash memory 14 at step S135 is a pigment system is grasped, the class of ink memorized by cartridge memory 43a at step S140 is read, and the purport which is a color system is grasped. As a result, at step S145, it will be distinguished if both are not in agreement, and an error message B is displayed on the liquid crystal display object 31.

[0074] By checking this error message B by looking, a user grasps having mistaken the class of ink and reequips with the ink cartridge 43 into which the ink of a pigment system was filled up with time of day t3. Consequently, it will be distinguished if ink mode and the ink class of ink cartridge with which it is equipped are in agreement at step S145, and printing processing of step S200 is performed. If printing processing is started, the counted value of the amount counter of the ink used of the above ASIC 13 will be cleared by "0" at step S205, a flash memory 14 will be referred to at step S210, and the purport by which ink mode is set as the pigment system will be grasped.

[0075] CPU12 reads the printing conditions which suit the pigment system concerned at step S215 with reference to a flash memory 14 further, and performs printing by the processing after step S220. At this time, the above-mentioned counted value of ASIC13 increases with printing activation. If printing is continued as it is, it will result in printing termination soon, but when a user removes an ink cartridge 43 (this example light Magenta) by a certain reason in the time of day t4 before resulting in printing termination, the above-mentioned control IC41a outputs the signal of a purport with which the ink cartridge was removed.

[0076] Consequently, the printing processing which CPU12 was performing is interrupted and the flow of drawing 8 is performed. That is, an error message C is displayed on the liquid crystal display object 31 at step S305, and when a user checks this error message C by looking, it urges reequipping with an ink cartridge 43. If a user equips with an ink cartridge 43, processing after step S315 will be performed through distinction of step S310, but when it equips with the ink cartridge 43 with which the ink of a color system which is different from other ink cartridges 43 at time of day t5 accidentally was filled up, an error message B is further displayed by processing of step S315 - step S330.

[0077] If it changes into the suitable cartridge by which the ink cartridge 43 was filled up with time of day t6 into pigment system ink when a user checked the error message concerned by looking, a flash memory 14 will be accessed at step S335 through distinction of step S325, and the counter coefficient of a pigment system will be read. And by multiplying the counted value

counted till the above-mentioned time of day t4 at step S340 by the counter coefficient concerned, the amount of the ink used is computed and cartridge memory 43a is updated through the above-mentioned control IC41a at step S345. That is, since an ink residue is updated when it equips with the again proper ink cartridge 43, while the counted value till then is held even if an ink cartridge 43 is removed in the middle of printing, the ink residue memorized by cartridge memory 43a will become proper.

[0078] Thus, in this invention, the class of ink memorized by the class and the above-mentioned nonvolatile memory of the ink which memorized the class of ink and the residue of ink to the nonvolatile memory carried in the ink cartridge, memorized the class of the ink when supplying ink to the ink supply system, and was said-memorized at the time of printing is compared.

Consequently, when both are in agreement, printing control which suited the class of the ink concerned can be performed, and mixing of ink can be prevented. Moreover, the amount of the ink used is computed according to head actuation, and since the residue of ink is updated, a proper ink residue can be judged.

[Translation done.]

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TECHNICAL FIELD

[The technical field to which invention belongs] This invention relates to data medium which recorded the printer control unit, the printer control method, and the printer control program.

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PRIOR ART

[Description of the Prior Art] As a printer which can perform printing according to image quality equivalent to a photograph, an ink jet printer is spreading quickly in recent years. Generally in this ink jet printer, two kinds such as pigment system ink and color system ink are used. With each property, two kinds of this ink has merits and demerits in image quality, lightfastness, etc., and is widely used by both. Moreover, even if it is the case where viscosity differs from density etc. and the two above-mentioned kinds of ink uses the same arm head, in order to perform suitable printing, making it correspond to said property, control conditions, such as discharge quantity of ink and regurgitation timing, differ in pigment system ink and color system ink, respectively.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to invention which starts claim 1, claim 11, and claim 21 as explained above, mixing of ink can be prevented, and data medium which recorded the printer control unit which can perform suitable control according to the class of ink, the printer control method, and the printer control program can be offered.

[0031] Moreover, according to invention concerning claim 2, claim 12, and claim 22, the proper ink residue in an ink cartridge can be judged. Furthermore, according to invention concerning claim 3, claim 13, and claim 23, the amount of the ink used is easily computable. Furthermore, according to invention concerning claim 4, claim 14, and claim 24, the configuration for computing the amount used for every class of ink can be realized easily, and the amount used can be easily obtained from counted value. Furthermore, according to invention concerning claim 5, claim 15, and claim 25, printing according to the class of ink can be performed easily.

[0032] Furthermore, according to invention concerning claim 6, claim 16, and claim 26, it can clean the condition for every class of ink. Furthermore, according to invention concerning claim 7, claim 17, and claim 27, Flushing can be performed the condition for every class of ink. Furthermore, according to invention concerning claim 8, claim 18, and claim 28, when the power supply of a printer is turned off suddenly, mixing of ink can be prevented after re-powering on, an ink residue can be judged appropriately, and head actuation for every class of ink can be performed exactly. Furthermore, according to invention concerning claim 9, claim 19, and claim 29, mixing of ink can be prevented certainly. Furthermore, according to invention concerning claim 10, claim 20, and claim 30, mixing of ink can be prevented certainly.

[0033]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing 1 is the outline perspective diagram showing the internal configuration of the ink jet printer carrying the printer control unit concerning 1 operation gestalt of this invention, and drawing 2 is the block diagram showing the connection condition of each hardware of the ink jet printer concerned. In drawing, it has the Maine substrate 11 and the printing section 20, the panel section 30, and the cartridge section 40 are connected to the Maine substrate 11, and an ink jet printer 10 functions as a printer, when CPU12 which it had on the Maine substrate 11 controls each part.

[0034] On the Maine substrate 11, it has others, ASIC13, a flash memory 14, and the head actuator 16. [above / CPU 12] ASIC13 is IC customized since the arm head 22 mentioned later was driven, and it performs processing for head 22 actuation, transmitting and receiving the above CPU 12 and a predetermined signal. As one of the processing of this, it has the amount counter of the ink used, and the number of dots printed is counted for every ink color. In addition, the applied-voltage data to the head actuator 16 which mentions later is outputted. The head actuator 16 generates the applied-voltage pattern to the piezo-electric element built in the arm head 22 which is the circuit which consists of Dedication IC, a transistor for actuation, a heat sink, etc., and is mentioned later.

[0035] A flash memory 14 is EEPROM which can eliminate the content of storage electrically, and can eliminate data per a chip package or block. Furthermore, the flash memory 14 concerning this operation gestalt is a boot block mold, and can forbid the store and elimination of

hardware-data to a predetermined block.

[0036] The printing section 20 is mainly equipped with the roller 21 and the arm head 22, and the arm head 22 is connected with the above-mentioned Maine substrate 11 through the predetermined trunk cable. Rotating by the motor which is driven by the motor control section which is not illustrated and which is not illustrated, the roller 21 is constituted so that a print sheet may be sent. while the arm head 22 is carried in the carriage which is not illustrated and this carriage makes an arm head 22 arrange near the periphery of the above-mentioned roller 21 -- an arm head 22 -- the shaft orientations of a roller 21 -- a round trip -- it is made movable.

[0037] Tube 22a of each ink color exception is connected to the arm head 22, and supply of each color ink is received. Moreover, the arm head 22 is equipped with the piezo-electric element which is not illustrated, and when a piezo-electric element drives at the ink room which is open for free passage from above-mentioned tube 22a to a delivery, the regurgitation of the ink is carried out per dot. The wiring on a predetermined trunk cable and a substrate connects, and this head actuator 16 impresses this generation voltage to an arm head 22 while generating predetermined voltage according to the command from the above ASIC 13, and as for an arm head 22 and the head actuator 16, it drives the above-mentioned carriage and a piezo-electric element.

[0038] The panel section 30 is equipped with the liquid crystal display object 31 and the manual operation button 32, and the panel section 30 is connected with the above-mentioned Maine substrate 11 by the predetermined trunk cable through panel I/O33. The liquid crystal display object 31 is a display which displays an alphabetic character etc. based on the predetermined signal transmitted from CPU12, and can display an error message, the status, etc. A manual operation button 32 is a carbon button used in case a user and a serviceman operate an ink jet printer 10, and by independent carbon button pushing actuation or two or more carbon button pushing actuation, the above CPU 12 distinguishes the content of actuation, and can direct now ON/OFF of a power supply, blowdown of print data, discharge of an error message, activation of the ink message exchange, activation of cleaning, etc.

[0039] The cartridge section is mainly equipped with the sub substrate 41, the cartridge holder 42, and the ink cartridge 43. The ink jet printer 10 concerning this operation gestalt uses cyanogen, a Magenta, yellow, light cyanogen, a light Magenta, and six colors of black; and fills up an ink cartridge 43 with each ink. The ink cartridge carries cartridge memory 43a, and the class of ink and the residue of ink with which it fills up are memorized by this cartridge memory 43a. Here, the data in which it is shown whether it is color system ink as a class of ink or it is pigment system ink is recorded. That is, this cartridge memory 43a constitutes the above-mentioned nonvolatile memory. Each cartridge holder 42 is equipped with contact section 42a with cartridge memory 43a, if the cartridge holder 42 is equipped with an ink cartridge 43, will contact cartridge memory 43a and will secure the connection for data transmission and reception. Moreover, the above-mentioned cartridge holder 42 is equipped with the ink supply needle which is not illustrated, if equipped with an ink cartridge 43, will contact the ink feed hopper with which this ink cartridge 43 is equipped and which is not illustrated, and will form the supply path of ink. The ink with which tube 22a was attached in the cartridge holder 42, and it filled up in the ink cartridge 43 through this tube 22a is supplied to the above-mentioned arm head 22.

[0040] It is carried in an ink jet printer 10 by equipping the cartridge holder 42 with each ink cartridge 43, and where the cartridge holder 42 is equipped, while ink supply is attained through the above-mentioned tube 22a, transmission and reception of data of the above-mentioned cartridge memory 43a are attained. That is, the predetermined trunk cable 40 is connected to the cartridge holder 42, and where the cartridge holder 42 is equipped with an ink cartridge 43, the communication line of the trunk cable 40 concerned and cartridge memory 43a is secured. Thus, in this operation gestalt, the cartridge holder 42 constitutes the above-mentioned applied part.

[0041] The above-mentioned cartridge memory 43a is controlled by transmitting and receiving a predetermined signal from control IC41a which the trunk cable 40 connected to the cartridge holder 42 was connected to the sub substrate 41, and was carried on this sub substrate 41. The

sub substrate 41 is connected to the above-mentioned Maine substrate 11 through the further predetermined trunk cable. The above-mentioned control IC41a is IC carried in order to control using two or more ink, i.e., two or more cartridge memory 43a, and performs read-out of the class of ink recorded on cartridge memory 43a, renewal of an ink residue; etc. by CPU12 on the Maine substrate transmitting and receiving a predetermined signal, and performing control IC41a and a communication link. Moreover, in this operation gestalt, in order to distinguish whether attachment and detachment of an ink cartridge 43 were performed, when the above-mentioned control IC41a outputs the signal which shows removal of an ink cartridge 43 when an ink cartridge 43 is removed from the cartridge holder 42 and it is equipped with an ink cartridge 43, the above-mentioned control IC41a outputs the signal which shows wearing of an ink cartridge 43.

[0042] On the above-mentioned Maine substrate 11, it has further predetermined communication link I/O15, and connects with the computer 50 of the exterior of an ink jet printer 10 through this communication link I/O15. If the driver for this ink jet printer 10 is installed in the computer 50 and a user performs printing of digital photograph data, while a driver will perform predetermined data conversion etc., print data and printing directions are transmitted to an ink jet printer 10, and the above CPU 12 prints print data according to printing directions.

[0043] Drawing 3 shows the important section of the memory map of a flash memory 14. Since the both sides of the ink of a color system and the ink of a pigment system are usable, in order that they may perform suitable control to the ink of both systems in a flash memory 14, as for the ink jet printer 10 concerning this operation gestalt, the parameter according to system of ink etc. is memorized. The initial flag which shows whether initial restoration filled up with predetermined ink in an ink supply system, i.e., the above-mentioned tube 22a, was specifically performed, and the ink mode which shows the class of ink current in use are memorized.

[0044] Furthermore, the printing conditions which are an actuation parameter according to class of ink are memorized to each of the ink of a pigment system, and the ink of a color system. These data is memorized by the protection block which can forbid the store and elimination of hardware-data. Thus, in this operation gestalt, a flash memory 14 constitutes the above-mentioned supply ink storage means and a printing condition storage means. There are a counter coefficient, driver voltage, cleaning conditions, and the Flushing conditions as printing conditions; and a counter coefficient is a coefficient by which the counted value in the above ASIC 13 is multiplied, and computes appropriately the amount of the ink used of both a pigment system and a color system from a unified count which is called the number of dots by the multiplication concerned. Moreover, since the ink of a pigment system differs from the ink of a color system, the property, i.e., the viscosity etc., of ink etc., though same actuation of the regurgitation of ink, cleaning, Flushing, etc. is carried out, concrete actuation of an arm head 22 differs.

[0045] Then, driver voltage, cleaning conditions, and the Flushing conditions are memorized for every system, and CPU12 reads this data and directs it to the above ASIC 13, and when the head actuator 16 carries out predetermined head actuation according to the directions concerned, suitable control is performed to the ink of both systems. For example, driver voltage is data in which the pattern of the applied voltage generated in the above-mentioned head actuator 16 at the time of printing is shown, and impresses voltage by pattern which is different as shown in drawing 4.

[0046] That is, if the driver voltage as printing conditions consists of a look-up table which indicated timer data and CPU12 directs to ASIC13 with reference to this lookup data, ASIC13 will change the timer data concerned and will output applied-voltage data to the head actuator 16. The head actuator 16 generates the pulse which is the temporal response of voltage with said applied-voltage data. While a pulse mainly has a lifting pulse and a downward pulse and applied voltage rises in a lifting pulse, the above-mentioned piezo-electric element drives, and the capacity of an ink room decreases. Moreover, while applied voltage descends in a downward pulse, the above-mentioned piezo-electric element drives, and the capacity of an ink room increases. Therefore, by adjusting the width of face of these pulses, the voltage which the above-mentioned head actuator 16 generates becomes abbreviation trapezoidal shape as shown in drawing 4, and the regurgitation of ink is controlled by this voltage.

[0047] The voltage pattern of this drawing 4 upside is the thing of a pigment system, inputs a downward pulse in a period t11 first, and makes the capacity of an ink room increase in the ink of the pigment system concerned. And after falling and making the condition of ink attach by suspending the input of a pulse in a period t12, and holding a piezo-electric element, a lifting pulse is inputted, the capacity of an ink room is decreased, and ink is made to breathe out in a period t13. Furthermore, the input of a pulse is suspended in a period t14, this condition is held, a downward pulse is inputted in a period t15, and regurgitation ink is divided. Then, while suspending the input of a pulse in a period t16 and carrying out fixed period maintenance of this condition, carriage is driven and the ink regurgitation sequence over the following dot is performed.

[0048] On the other hand, the voltage pattern of the drawing 4 bottom is the thing of a color system, in the ink of the color system concerned, inputs a lifting pulse in a period t21 first, and decreases the capacity of an ink room. And after falling and making the condition of ink attach by suspending the input of a pulse in a period t22, and holding a piezo-electric element, this condition is held in a period t24, it falls and the condition of ink is made to input a downward pulse, to make the capacity of an ink room increase, and to attach in a period t23. Furthermore, a lifting pulse is inputted again, the capacity of an ink room is decreased, and ink is made to breathe out in a period t25. This condition is held in next in a period t26, a downward pulse is inputted into it in a period t27, regurgitation ink is divided, this condition is held in a period t28, and the regurgitation sequence of 1 dot is ended.

[0049] Thus, in the ink of a pigment system, and the ink of a color system, head actuation patterns also differ from the difference in an ink property, in order to perform control suitable for each system, driver voltage is held according to the ink system, and according to the class of ink, it is referred to suitably. Besides the driver voltage at the time of this printing, it is generable [the head actuator 16 / the voltage for cleaning or Flushing], and an arm head 22 can perform the regurgitation of the ink which is unrelated to printing with the voltage concerned. That is, on the other hand, the pump unit 24 is arranged directly under the edge, and attraction of thickening ink and initial restoration processing to tube 22a can be performed by making negative pressure act to the arm head 22 of a reciprocating motion of an arm head 22 conveyed to this pump-unit location.

[0050] The head actuator 16 impresses predetermined driver voltage to a pump unit 24 through the cable which is not illustrated. If fixed time amount passes during printing, the Flushing conditions according to the class of ink will be referred to. An arm head 22 is made to perform the predetermined ink regurgitation, and while referring to the cleaning conditions according to an ink class according to the predetermined actuation in the above-mentioned manual operation button 32, predetermined cleaning actuation can be performed on an arm head 22. Furthermore, after exchange of an ink cartridge, initial restoration processing to tube 22a is performed.

[0051] Drawing 5 is the schematic diagram having shown the outline of the control which the printer control unit applied to this invention in the above-mentioned configuration carries out. In order for the above CPU 12 to bear the main control in the printer control unit and to perform processing according to the class of ink, CPU12 compares the ink mode memorized by the class and flash memory 14 of the ink memorized by the above-mentioned cartridge memory 43a. It prints in the condition of having made in agreement the class of ink in which under the current activity memorized as ink mode (i.e., an ink supply system) is filled up with ink, and the class of ink with which the ink cartridge 43 is filled up.

[0052] Moreover, since an arm head 22 is driven on the conditions which suited the class of ink it was presupposed that it was in agreement of ink with these comparisons, with reference to a flash memory 14, an arm head 22 is driven using the parameter of pigment system control or color system control according to the class of ink current in use. Furthermore, by updating it from the ink residue of the above-mentioned cartridge memory 43a, as the amount used concerned is reduced, while computing the amount of the ink used by multiplying the number of dots counted by ASIC13 by the counter coefficient according to the class of ink, even if it is pigment system ink and is color system ink, the ink residue is memorized to accuracy. Thus, in this operation gestalt, CPU12, ASIC13, the head actuator 16, and control IC41a constitute the

above-mentioned head actuation control means.

[0053] Drawing 6 -8 show the flow chart of the processing which CPU12 performs with an ink jet printer 10 including the above control. Drawing 6 is processing performed after boot of an ink jet printer 10, and CPU12 distinguishes whether the above-mentioned initial flag is ON with reference to a flash memory 14 at step S100. Processing for being filled up with ink in the tube 22a concerned is performed noting that ink supply systems, such as above-mentioned tube 22a, are not filled up with ink, when it is not distinguished at this step S100 that an initial flag is ON.

[0054] At this time, in step S105, CPU12 performs the above-mentioned control IC41a and a communication link, carries out reading appearance of the ink class of cartridge memory 43a to this control IC41a, and grasps the class of ink of six colors each. At step S110, it distinguishes whether the class of this read ink is the same class also as six colors, when it is not distinguished that it is the same class, the panel section 30 is controlled by step S115 through above-mentioned panel I/O33, and the error message A shown in the liquid crystal display object 31 at drawing 9 is displayed.

[0055] An error message A is a message "six colors of cartridges are not unified", and the processing after the above-mentioned step S105 is repeated, urging exchanging the ink cartridge 43 which the user was mistaken in and was inserted where the message concerned is displayed to a proper thing. When the class of ink is distinguished at the above-mentioned step S110 as it is the same class also as six colors, restoration processing of ink to an ink supply system is performed at step S120. The restoration processing concerned is a special sequence which makes an ink supply system fill up with ink, after this sequence is performed, an ink supply system is filled up with the ink in an ink cartridge, and the ink interior of a room of an arm head 22 is also filled up with ink. Therefore, if the piezo-electric element in an arm head 22 is driven in this condition, ink will be breathed out from the nozzle of an arm head 22.

[0056] After this restoration processing, the class of ink which accessed the above-mentioned flash memory 14 at step S125, and carried out [above-mentioned] restoration is set up as ink mode. Furthermore, the above-mentioned flash memory 14 is accessed at step S130, and the above-mentioned initial flag is set. When it is distinguished at the case where such restoration processing is performed, and the above-mentioned step S100 that an initial flag is ON, while accessing the above-mentioned flash memory 14 at step S135 and reading the above-mentioned ink mode, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S140, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped.

[0057] And it distinguishes whether the ink mode memorized by the class and flash memory 14 of the ink filled up with step S145 into the ink cartridge 43 is in agreement. When both were in agreement at step S145 and it is distinguished, printing processing is performed at step S200. If both are in agreement at step S145, when not being distinguished, the panel section 30 is controlled by step S150 through above-mentioned panel I/O33, and the error message B shown in the liquid crystal display object 31 at drawing 10 is displayed.

[0058] An error message B is a message of "being equipped with the ink in which ink modes differ", and the processing after the above-mentioned step S140 is repeated, urging exchanging the ink cartridge 43 which the user was mistaken in and was inserted where the message concerned is displayed to a proper thing. Processing which is standing by and shows that print-data transmission is carried out with printing directions from the above-mentioned computer 50 in printing processing of step S200 to drawing 7 after printing directions is performed.

[0059] At step S205, the above ASIC 13 is accessed, a counter is cleared to "0" at the amount step S210 of the ink used in this ASIC13, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S210, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped. And a flash memory 14 is accessed at step S215, and the printing conditions which suited the class of the ink concerned are read.

[0060] Printing is performed driving a part for a predetermined line based on the print data transmitted from the above-mentioned computer 50 after step S220. At step S220, with reference to the driver voltage of the printing conditions which suited the class of the above-

mentioned ink, a command is transmitted to the above ASIC 13, and an arm head 22 is driven by making the head actuator 16 output the above-mentioned pulse. Thus, an arm head 22 is driven, and at step S225, the count is performed by ASIC13, moving an arm head 22 by carriage and performing printing.

[0061] after printing for a predetermined line is completed, reading appearance of the counter coefficient which accessed the flash memory 14 at step S230, and suited the class of ink is carried out, and the amount of the ink used is computed by multiplying by the counter coefficient concerned which carried out reading appearance and the counted value of the above ASIC 13 at step S235. As the amount of the ink used which computed the command at this step S235 from delivery and the ink residue memorized at cartridge memory 43a is reduced to the above-mentioned control IC41a, it is made to update the ink residue concerned at step S240. In step S245, the above ASIC 13 is accessed and a counter is again cleared to "0" at the amount step S210 of the ink used in this ASIC13.

[0062] And the processing after the above-mentioned step S220 is repeated until it distinguishes that it was finished whether printing all the print data transmitted from the above-mentioned computer 50 in step S250 and having finished printing is distinguished. In addition, in one end position of a reciprocating motion according [the above-mentioned arm head 22] to carriage, Flushing is made with this operation gestalt. That is, after fixed time amount passes during printing, an arm head 22 is conveyed even to the Flushing field, and Flushing is performed, reading the Flushing conditions which suit the class of ink read from the flash memory 14 at the above-mentioned step S210. Moreover, when an ink cartridge 43 is removed in this operation gestalt, in order to prevent continuing performing printing, when the signal which control IC41a outputs when the above-mentioned ink cartridge 43 is removed is detected, processing which interrupts processing of steps S205-S250 of drawing 7 , and is shown in drawing 8 is performed.

[0063] If the signal which shows that the ink cartridge 43 was removed is detected, the panel section 30 will be controlled by step S305 through above-mentioned panel I/O33, and the error message C shown in the liquid crystal display object 31 at drawing 11 will be displayed. An error message C is a message "equip with a cartridge", and the processing after the above-mentioned step S305 is repeated until the signal which shows that it equipped with the ink cartridge 43 at step S310 is detected a user urging equipping with an ink cartridge 43 where the message concerned is displayed. If the signal which shows that it equipped with the ink cartridge 43 at step S310 is detected, while accessing the above-mentioned flash memory 14 at step S315 and reading the above-mentioned ink mode, reading appearance of the ink class of cartridge memory 43a is carried out to the above-mentioned control IC41a at step S320, and the class of ink with which the ink cartridge 43 with which it is equipped was filled up is grasped.

[0064] And it distinguishes whether the ink mode memorized by the class and flash memory 14 of the ink filled up with step S325 into the ink cartridge 43 is in agreement. If both are in agreement at step S325, when not being distinguished, the panel section 30 is controlled by step S330 through above-mentioned panel I/O33, and the error message B shown in the liquid crystal display object 31 at drawing 10 is displayed. when both were in agreement at step S325 and it is distinguished, reading appearance of the counter coefficient which accessed the flash memory 14 at step S325, and suited the class of ink is carried out, and the amount of the ink used is computed by multiplying by the counted value currently held at step S340 by the counter coefficient which carried out reading appearance and Above ASIC 13 concerned.

[0065] As the amount of the ink used which computed the command at this step S340 from delivery and the ink residue memorized at cartridge memory 43a is reduced to the above-mentioned control IC41a, it is made to update the ink residue concerned at step S345. That is, after the restoration ink of an ink cartridge 43 with which it is re-equipped judges whether it is the right, an ink residue is updated based on the counted value counted until the cartridge was extracted. Therefore, even if it is the case where an ink cartridge 43 is in the middle of printing, and is removed, it becomes a right ink residue. Then, it returns to the printing processing shown in above-mentioned drawing 7 .

[0066] Furthermore, in this operation gestalt, it is usable in the both sides of the ink of a pigment system, and the ink of a color system, and the class of the ink concerned can be changed. On

the occasion of exchange of an ink system, if the ink of both systems is mixed, in a print, it will not become suitable coloring, and various inconvenience arises from the actuation patterns of head 22 grade differing. Therefore, on the occasion of exchange of an ink system, it is necessary to also carry out washing of the above-mentioned ink supply system. When a user or a serviceman performs predetermined pushing actuation with the manual operation button 32 of the above-mentioned panel section 30, it is possible to carry out the message exchange of ink. [0067] That is, if predetermined pushing actuation is performed in the above-mentioned manual operation button 32, the predetermined trigger according to the actuation concerned will be outputted, and if CPU12 receives the trigger concerned, even if printing will perform, the message exchange shown in step S400 of drawing 6 is performed. Expressing a predetermined guidance message on the liquid crystal display object 31 of the above-mentioned panel section 30 as step S410 in this message exchange, it is made to equip with the cartridge by which the penetrant remover went into the cartridge holder 42, and the washing sequence over an ink supply system is performed. Since the ink supply system of an ink jet printer 10 of after this washing processing is the same as that of an off, a new condition and a new EQC, i.e., an initial flag, condition, processing after the above-mentioned step S105 is performed.

[0068] Furthermore, if cleaning actuation which washes the arm head 22 other than the washing processing at the time of this ink system modification can be performed and predetermined pushing actuation is performed with the manual operation button 32 of the above-mentioned panel section 30 If the predetermined trigger according to the actuation concerned is outputted and CPU12 receives the trigger concerned The wiping member which CPU12 becomes from elastic plates, such as rubber, after it discharges directions by delivery and it makes the head actuator 16 discharge ink with negative pressure through the above ASIC 13 performs wiping actuation on the front face of head.

[0069] Hereafter, the example of operation performed with this operation gestalt by the above-mentioned configuration and the processing flow is explained. Drawing 12 shows the signal outputted when the content and cartridge in ink mode which are memorized by the class and flash memory 14 of the ink with which it filled up in each ink cartridge 43 are removed, and the counted value in ASIC13 by the timing chart. Suppose that the ink cartridge of the ink of a pigment system, yellow (Y), and a light Magenta (LM) is filled up with the ink of a color system at the ink cartridge of cyanogen (C), a Magenta (M), black (K), and light cyanogen (LC) as an initial state in this example of operation.

[0070] In this condition, if an ink jet printer 10 is booted, processing shown in above-mentioned drawing 6 is performed, and it distinguishes whether an initial flag is ON at step S100, and read-out of the ink class in step S105 and distinction in step S110 will be performed noting that an initial flag is not ON. Here, since the thing of a pigment system and the thing of a color system are intermingled, the ink with which the ink cartridge is filled up displays an error message A on the liquid crystal display object 31 in step S115 through distinction of step S110.

[0071] A user grasps that the class of ink is intermingled by checking this error message A by looking, and he equips with the ink cartridge of the yellow with which the ink of a pigment system was filled up, and a light Magenta while he removes the ink cartridge of the above-mentioned yellow and a light Magenta at time of day t1. Consequently, it will distinguish, if the ink of the same class is filled up with step S110 into all ink cartridges, initial restoration to an ink supply system is performed at step S120, and while setting ink mode as a flash memory 14 as a pigment system at step S125, an initial flag is set at step S130.

[0072] Furthermore, the class of ink may be mistaken, when the initial flag is turned on and an ink jet printer 10 is conveyed, and an ink cartridge 43 is once removed and it equips with it again. For example, suppose that it equipped with the ink cartridge 43 into which the ink of a color system was filled up with time of day t2, and the ink jet printer 10 was booted after carrying out the above-mentioned initial restoration.

[0073] In this case, if the initial flag is turned on at step S100, after distinguishing, the purport whose ink mode memorized by the flash memory 14 at step S135 is a pigment system is grasped, the class of ink memorized by cartridge memory 43a at step S140 is read, and the purport which is a color system is grasped. As a result, at step S145, it will be distinguished if both are not in

agreement, and an error message B is displayed on the liquid crystal display object 31.

[0074] By checking this error message B by looking, a user grasps having mistaken the class of ink and reequips with the ink cartridge 43 into which the ink of a pigment system was filled up with time of day t3. Consequently, it will be distinguished if ink mode and the ink class of ink cartridge with which it is equipped are in agreement at step S145, and printing processing of step S200 is performed. If printing processing is started, the counted value of the amount counter of the ink used of the above ASIC 13 will be cleared by "0" at step S205, a flash memory 14 will be referred to at step S210, and the purport by which ink mode is set as the pigment system will be grasped.

[0075] CPU12 reads the printing conditions which suit the pigment system concerned at step S215 with reference to a flash memory 14 further, and performs printing by the processing after step S220. At this time, the above-mentioned counted value of ASIC13 increases with printing activation. If printing is continued as it is, it will result in printing termination soon, but when a user removes an ink cartridge 43 (this example light Magenta) by a certain reason in the time of day t4 before resulting in printing termination, the above-mentioned control IC41a outputs the signal of a purport with which the ink cartridge was removed.

[0076] Consequently, the printing processing which CPU12 was performing is interrupted and the flow of drawing 8 is performed. That is, an error message C is displayed on the liquid crystal display object 31 at step S305, and when a user checks this error message C by looking, it urges reequipping with an ink cartridge 43. If a user equips with an ink cartridge 43, processing after step S315 will be performed through distinction of step S310, but when it equips with the ink cartridge 43 with which the ink of a color system which is different from other ink cartridges 43 at time of day t5 accidentally was filled up, an error message B is further displayed by processing of step S315 – step S330.

[0077] If it changes into the suitable cartridge by which the ink cartridge 43 was filled up with time of day t6 into pigment system ink when a user checked the error message concerned by looking, a flash memory 14 will be accessed at step S335 through distinction of step S325, and the counter coefficient of a pigment system will be read. And by multiplying the counted value counted till the above-mentioned time of day t4 at step S340 by the counter coefficient concerned, the amount of the ink used is computed and cartridge memory 43a is updated through the above-mentioned control IC41a at step S345. That is, since an ink residue is updated when it equips with the again proper ink cartridge 43, while the counted value till then is held even if an ink cartridge 43 is removed in the middle of printing, the ink residue memorized by cartridge memory 43a will become proper.

[0078] Thus, in this invention, the class of ink memorized by the class and the above-mentioned nonvolatile memory of the ink which memorized the class of ink and the residue of ink to the nonvolatile memory carried in the ink cartridge, memorized the class of the ink when supplying ink to the ink supply system, and was said-memorized at the time of printing is compared. Consequently, when both are in agreement, printing control which suited the class of the ink concerned can be performed, and mixing of ink can be prevented. Moreover, the amount of the ink used is computed according to head actuation, and since the residue of ink is updated, a proper ink residue can be judged.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The following technical problems occurred in the conventional ink jet printer mentioned above. That is, wearing of the ink cartridge of a class which makes a mistake in two kinds of ink, and is different before carrying out exchange and washing of an ink supply system also in an usable printer will mix the ink of a different system inside an ink supply system. Since it becomes impossible to perform discharge quantity control according to the property of ink etc. when two kinds of ink has been mixed, printing quality is spoiled. Therefore, in order to exchange the two above-mentioned kinds of ink and to prevent mixing of the ink in an ink supply system in an usable ink jet printer, exchange and washing of an ink supply system are needed at the time of exchange of an ink class.

[0004] Furthermore, although the residue of the ink with which the ink cartridge is filled up in the ink jet printer may be supervised and it may display as the status Before exhausting ink in the conventional ink jet printer mentioned above, from an exchangeable thing, an ink cartridge in pigment system ink and color system ink When the class of ink was changed and the class of ink was returned further once again after using ink to the middle, there was a problem that the ink residue of the original cartridge could not be judged correctly.

[0005] This invention was made in view of the above-mentioned technical problem, and even if it changes an ink cartridge what times, it aims at offering the printer control unit which can judge an ink residue correctly, the printer control method, and a printer control unit, while carrying out proper control according to an ink class, preventing mixing of the ink of a different system in the printer which can exchange an ink class.

[Translation done.]

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MEANS

[Means for Solving the Problem] Invention which starts claim 1 in order to attain the above-mentioned object is constituted so that a printer which prints while supplying ink with which an exchangeable ink cartridge was filled up to an arm head may be controlled, and it is controlled, preventing mixing of an ink class. For this reason, nonvolatile memory which can update the content of storage is carried in an exchangeable ink cartridge, and a class of ink with which an ink cartridge is filled up is memorized by this nonvolatile memory. This ink cartridge is detached and attached through an ink cartridge applied part by main part of a printer, and data transmission and reception from the above-mentioned nonvolatile memory are possible for it at the time of wearing.

[0007] Furthermore, a class of ink currently supplied to an ink supply system which consists of ink supply tubes from an ink cartridge to an arm head etc. is memorized by supply ink storage means, and printing conditions required for actuation of an arm head are memorized by printing condition storage means according to a class of ink. A head actuation control means uses such storage information in printing, and compares a class of ink memorized by a class of ink and the above-mentioned supply ink storage means which were memorized by nonvolatile memory. And actuation of an arm head is controlled based on printing conditions which drive an arm head in the condition that a class of both ink is in agreement, and suit this ink class in agreement.

[0008] Namely, a class of ink memorized by the above-mentioned nonvolatile memory is uniquely in agreement with a class of ink with which an ink cartridge was filled up. Since a class of ink memorized by supply ink storage means is uniquely in agreement with a class of ink currently supplied to an ink supply system When a head actuation control means compares these, it can prevent driving an arm head using an ink cartridge of a class of different ink from a class of ink already supplied to an ink supply system, and mixing of ink can be prevented.

[0009] Here, updating of the content of storage is possible for it, and if the above-mentioned nonvolatile memory is nonvolatile, can adopt good various modes and is constituted from EEPROMs, such as a flash memory, it is suitable. Moreover, although what is necessary is just to memorize whether a class of ink is the thing of whether restoration ink is the thing of a color system as information which is used in order to prevent mixing of ink as mentioned above, and for that shows a class of ink, and a pigment system, it is possible to memorize various information in addition to this as a class of ink. That is, by referring to the restoration day concerned, if a restoration day of ink is memorized, it can constitute so that ink over which the expiration date passed may not be used. Moreover, even if it is ink of a same system, actuation of an arm head is controllable by the best actuation sequence over the ink by memorizing information which shows a purport from which a component differs.

[0010] It is removable in an ink cartridge, and the ink cartridge attachment-and-detachment section equips a holder of a fitting type with a container which has capacity which can be filled up with ink that what is necessary is just to be able to enable data transmission and reception from nonvolatile memory at the time of ink cartridge wearing, and a configuration which secures a flow of a terminal of nonvolatile memory to fitting concerned and coincidence is possible for it. It can constitute from rewritable various memory that what is necessary is just to be able to memorize a class of ink currently supplied to an ink supply system in a supply ink storage means.

Although RAM etc. can constitute, if a printer is frequently constituted from EEPROMs, such as a flash memory, a place whose power supply is what is turned on / turned off, it is suitable.

[0011] It can constitute from various memory that what is necessary is just to be able to memorize according to a class of ink filled up with printing conditions required for actuation of an arm head by the above-mentioned ink cartridge in a printing condition storage means. Although a mask ROM etc. can also constitute, the status changes with activities serially, and since it is the mode which can change activity ink, if especially this invention is constituted from EEPROMs, such as a rewritable flash memory, it is suitable [this invention] for a printer. If a head control driving means is constituted from a CPU etc., it is [that what is necessary is to read and calculate information from various memory etc. and just to be able to control memory, an arm head, etc.] suitable.

[0012] As a configuration for controlling to be able to judge an ink residue correctly, furthermore, invention according to claim 2 In a printer control unit given in above-mentioned claim 1 the above-mentioned nonvolatile memory A residue of ink with which an ink cartridge is filled up is memorized, and the above-mentioned head actuation control means is considered as a configuration which updates a residue of ink memorized by the above-mentioned nonvolatile memory based on the calculation concerned while it computes the amount of ink used consumed with actuation of the above-mentioned arm head.

[0013] That is, since a residue of ink is updated with actuation of a printer, it becomes the residue of proper ink. Since a residue of ink is memorized by nonvolatile memory carried in the ink cartridge itself, it removes, before consuming ink with which it filled up, other ink cartridges are used, and an ink residue will become proper even if it uses an ink cartridge removed again. of course -- even if it uses it, removing an ink cartridge and making other printers equip -- being concerned -- others -- if a printer control unit which requires a printer for this invention is provided, it will become a proper ink residue.

[0014] Moreover, the technique of computing the amount of ink used by head actuation control means is various, and invention according to claim 3 is considered as a configuration which computes the amount of the ink used based on a counter which the above-mentioned head actuation control means increases with actuation of the above-mentioned arm head in a printer control unit given in above-mentioned claim 2 as an example of a configuration for it. That is, since an arm head drives at the time of printing, if a counter which counted value increases with actuation of the arm head concerned is used, based on the counted value concerned, the amount used is easily computable. The technique of more specifically counting the number of dots which carries out the regurgitation by arm head is employable. What is necessary is just to compute the amount used for every class of ink based on the number of dots, although the amount used may change with classes of ink also with the same number of dots since a class of ink can be changed in this invention. Thus, when computing the amount of ink used based on counted value, especially this count should just form a single counter, without distinguishing according to a class of ink.

[0015] As an example of printing conditions which various conditions exist as printing conditions required for actuation of the above-mentioned arm head, and need to be memorized according to a class of ink, furthermore, invention according to claim 4 In a printer control unit given in above-mentioned claim 3, the above-mentioned printing condition storage means is considered as a configuration which memorizes the amount calculation coefficient of the ink used for computing the amount of the ink used by taking an advantage at counted value of the above-mentioned counter.

[0016] That is, since above-mentioned counted value and the amount of ink used are usually in proportionality, if the amount calculation coefficient of the ink used which computes the amount of the ink used by taking the advantage of counted value is prepared, the amount used can be easily obtained from counted value only by 1 time of multiplication. Moreover, it can constitute very easily [that the amount coefficient of the ink used for every class of ink may only be memorized], and in order to compute the amount used for every class of ink, also when it is necessary to correspond to ink in which a class of ink increases or properties differ, it can respond easily.

[0017] Furthermore, invention according to claim 5 is considered as a configuration which memorizes a driver voltage pattern impressed in case the above-mentioned printing condition storage means drives the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 4 as other examples of printing conditions which need to be memorized according to a class of ink. That is, when classes of ink differ like ink of a pigment system, and ink of a color system, conditions which drive an arm head differ. For example, if the above-mentioned ink classes differ in the case of a printer which controls discharge quantity, regurgitation timing, etc. of ink by telescopic motion of a piezo-electric element etc., 1 time of ink discharge quantity differs from regurgitation timing etc. Since it is controlled by changing a driver voltage pattern impressed to an arm head, such discharge quantity etc. can perform printing according to a class of ink easily, if a driver voltage pattern is memorized according to a class of ink as printing conditions.

[0018] Furthermore, invention according to claim 6 is considered as a configuration which memorizes actuation conditions which the above-mentioned printing condition storage means needs for cleaning of an ink supply system in the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 5 as other examples of printing conditions which need to be memorized according to a class of ink. Namely, since an ink supply system may be cleaned, ink is once discharged in this case and wiping etc. is carried out when a case where a printer is not used for a long time, and printing quality have deteriorated, in order to make blowdown perform exactly, it is necessary to drive an arm head a condition for every class of ink, and, in such a case, can respond.

[0019] Furthermore, since a class of ink can be exchanged in this invention, it is necessary to also wash an ink supply system from a cartridge to an arm head on the occasion of exchange, and when performing this washing sequence, in order to make ink of an ink supply system discharge exactly, it is necessary to drive an arm head a condition for every class of ink, and, also in such a case, can respond.

[0020] Furthermore, invention according to claim 7 is considered as a configuration which memorizes actuation conditions which the above-mentioned printing condition storage means needs for Flushing in the above-mentioned arm head in a printer control unit given in either above-mentioned claim 1 - claim 6 as other examples of printing conditions which need to be memorized according to a class of ink. Namely, although Flushing may be performed in order to carry out regurgitation blowdown of the color mixture ink which flowed backwards from a nozzle by wiping or to prevent blinding by thickening of ink, from it being what should be determined with the property of an ink class, timing which performs this Flushing, and a regurgitation discharge at the time of Flushing need to drive an arm head a condition for every class of ink, in order to perform Flushing exactly, and, in such a case, can respond.

[0021] Furthermore, when a power supply of a printer is turned off suddenly, mixing of ink is prevented after re-powering on. As an example for judging an ink residue appropriately and constituting it possible [activation of head actuation for every class of ink] exactly, invention according to claim 8 In a printer control unit given in either above-mentioned claim 1 - claim 7, either or combination of the above-mentioned nonvolatile memory, a supply ink storage means, and a printing condition storage means is considered as a configuration which can be set up so that a store and elimination of storage information may be forbidden.

[0022] That is, if a store and elimination of storage information can be forbidden, when a case where a power supply was turned off suddenly and a power supply becomes instability, and a noise increase, required storage information is not updated and a printer can be driven in the original condition after re-powering on. For example, since storage information on a supply ink storage means is still origin, in spite of having already supplied ink after re-powering on at an ink supply system, it is going to perform supply of further different ink and ink is not mixed. Moreover, an arm head is not driven using ink currently supplied to an ink supply system, and different ink. Furthermore, when a power supply becomes instability, information for computing the above-mentioned amount of the ink used is memorized for a printing condition storage means etc., and if an ink residue is updated based on the memorized amount of the ink used concerned after a power supply is stable, a more exact ink residue can be obtained. Here, as a

flume which forbids a store and elimination of storage information, when storage information needs to be updated of course, it updates by canceling a prohibition condition of a store and elimination.

[0023] Furthermore, invention according to claim 9 is considered as a configuration in which the above-mentioned head actuation control means performs a comparison of a class of the above-mentioned ink at the time of exchange of the above-mentioned ink cartridge in a printer control unit given in either above-mentioned claim 1 – claim 8 as an example of a configuration for controlling to prevent mixing of ink in the above-mentioned head actuation control means. That is, a printer concerning this invention is considered [mistaking a class of ink in many cases at the time of this exchange since it is exchangeable, and] in an ink cartridge, and can prevent mixing of ink certainly by performing the above-mentioned comparison at the time of this exchange. It constitutes so that various modes can be adopted in order to detect exchange of an ink cartridge here, for example, it may remove with the time of wearing of an ink cartridge and a predetermined signal may sometimes be outputted, and when a signal which shows wearing is detected, it can constitute so that a comparison may be performed.

[0024] Furthermore, invention according to claim 10 has considered [as an example of the configuration for preventing mixing of ink in the above-mentioned head actuation control means] as the configuration which updates at a class of the supplied ink concerned in a class of ink memorized by the above-mentioned supply ink storage means in a printer control unit given in either above-mentioned claim 1 – claim 9, after the above-mentioned head actuation control means supplies ink to the above-mentioned ink supply system.

[0025] That is, since a printer concerning this invention can change suitably a class of ink used by exchange of a cartridge, in case it changes a class of the ink concerned, it will also wash ink currently supplied to the above-mentioned ink supply system, and will newly be resupplied. Then, if a class of ink memorized by supply ink storage means by head actuation control means after supply of ink to an ink supply system is updated, an arm head can be driven using always proper ink by the comparison of a class of the above-mentioned ink, even if it carries out the message exchange of ink what times, and mixing of ink can be prevented.

[0026] Thus, while memorizing a class of ink, and a residue of ink to nonvolatile memory carried in an ink cartridge and preventing mixing of ink with reference to these, the technique of grasping a residue of ink proper does not necessarily need to be restricted to equipment with substance, and functioning also as the method can be understood easily. For this reason, invention concerning claim 11 – claim 20 is considered as a configuration corresponding to a control method which said printer control unit enforces. That is, there is no difference not only in equipment which not necessarily has substance but in being effective as the method.

[0027] By the way, such a printer control unit contains not only this but various kinds of modes as thought of that it may be used in the condition of existing independently and having been included in a certain device, and invention. Therefore, it can change suitably that it is software or hardware etc. When becoming the software of a printer control unit as an example of embodiment of thought of invention, naturally it exists on a record medium which recorded this software, and it must be said that it is used. Invention which starts claim 21 – claim 30 in the semantics is considered as a configuration corresponding to each step which makes said printer control unit carry out by computer.

[0028] of course, the record medium may be magnetic-recording data medium, may be magneto-optic-recording data medium, and can completely be considered the same way in any record media developed from now on. Moreover, about duplicate phases, such as a primary replica and a secondary replica, it is equivalent without room to completely ask. If above-mentioned data medium is the case where it carries out as the supply method using a communication line although it differs, a communication line serves as a transmission medium and this invention will be used.

[0029] Furthermore, a part is software, when a part is realized by hardware, there is nothing that is completely different in thought of invention, and it may be made into a thing of a gestalt which memorizes a part on a record medium and is read suitably if needed. Moreover, when carrying out this invention by software, it not only realizes as data medium by which invention recorded a

program, but naturally this invention is realized as the program itself, and the program itself is included in this invention.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline perspective diagram showing the internal configuration of an ink jet printer.

[Drawing 2] It is the block diagram of an ink jet printer.

[Drawing 3] It is drawing showing the important section of the memory map of a flash memory.

[Drawing 4] It is drawing showing the pattern of the applied voltage generated in a head actuator.

[Drawing 5] It is the schematic diagram having shown the outline of the control which a printer control unit carries out.

[Drawing 6] It is the flow chart of the processing which CPU performs.

[Drawing 7] It is the flow chart of the processing which CPU performs.

[Drawing 8] It is the flow chart of the processing which CPU performs.

[Drawing 9] It is drawing showing the example of a display of an error message.

[Drawing 10] It is drawing showing the example of a display of an error message.

[Drawing 11] It is drawing showing the example of a display of an error message.

[Drawing 12] It is the timing chart which shows actuation of each part.

[Description of Notations]

- 10 -- Ink jet printer
- 11 -- Main substrate
- 12 -- CPU
- 13 -- ASIC
- 14 -- Flash memory
- 16 -- Head actuator
- 20 -- Printing section
- 21 -- Roller
- 22 -- Arm head
- 22a -- Tube
- 30 -- Panel section
- 31 -- Liquid crystal display object
- 32 -- Manual operation button
- 40 -- Cartridge section
- 41 -- Sub substrate
- 41a -- Control IC
- 42 -- Cartridge holder
- 43 -- Ink cartridge
- 43a -- Cartridge memory
- 50 -- Personal computer

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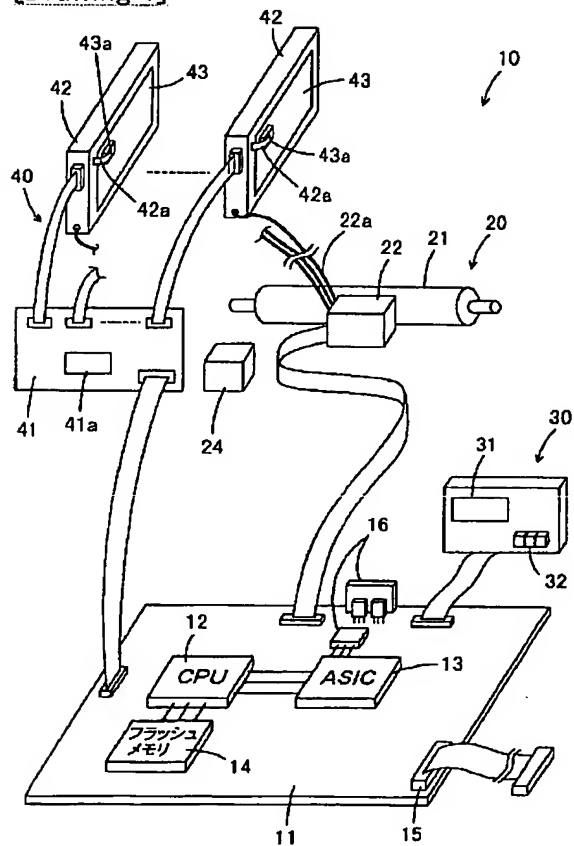
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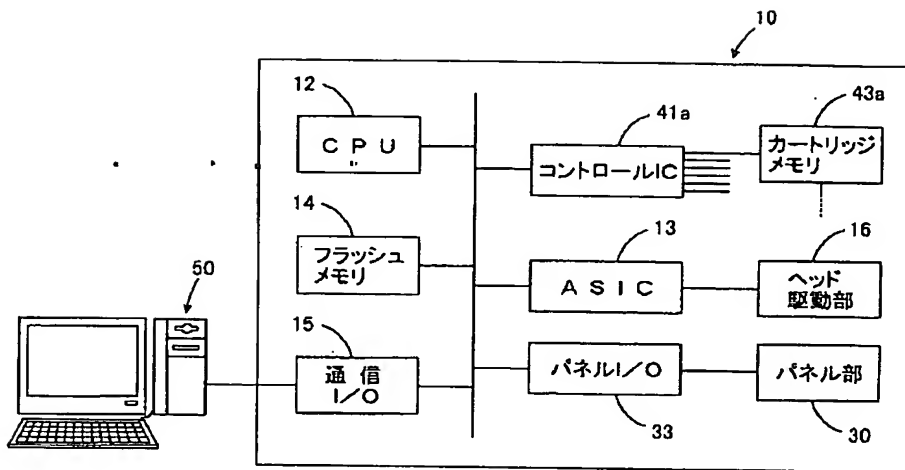
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DRAWINGS

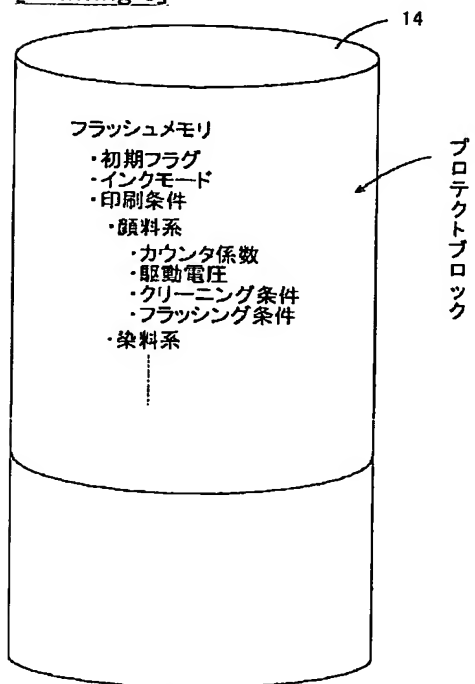
[Drawing 1]



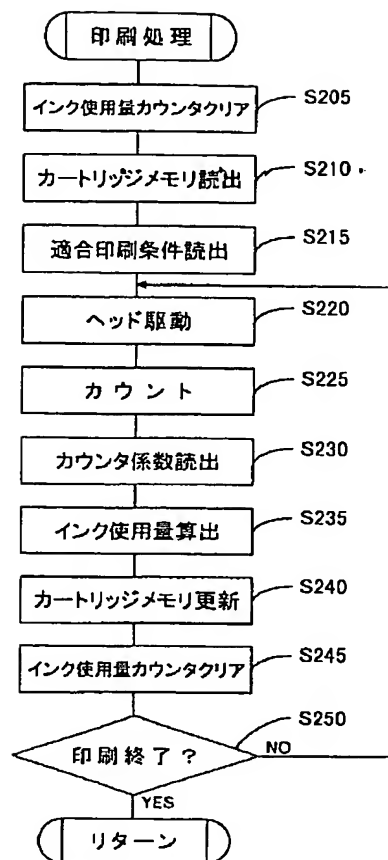
[Drawing 2]



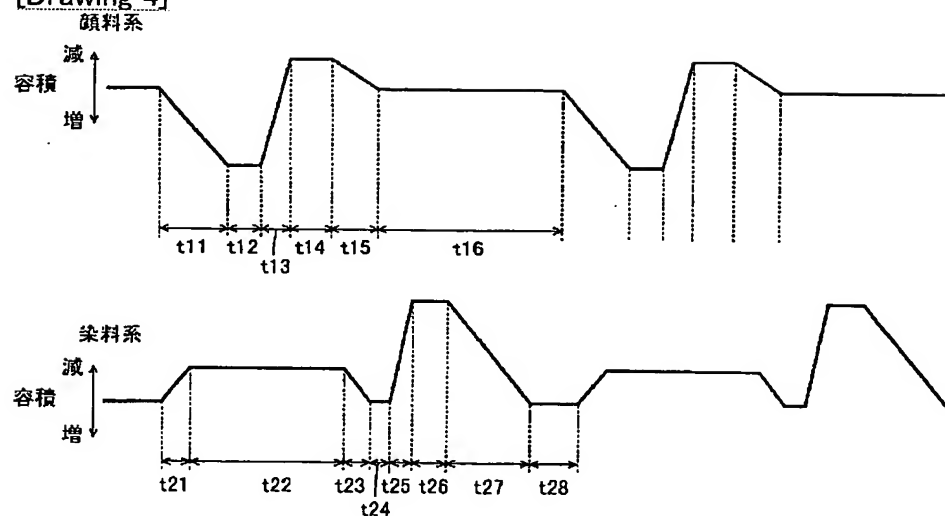
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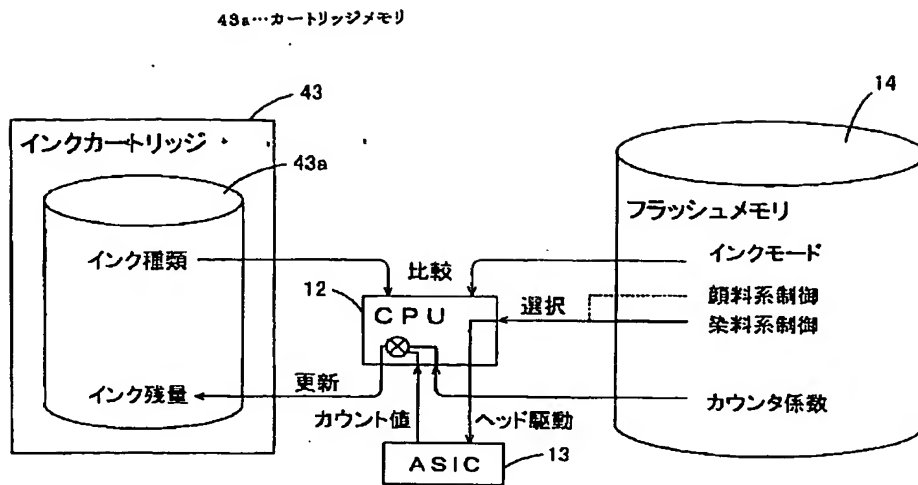
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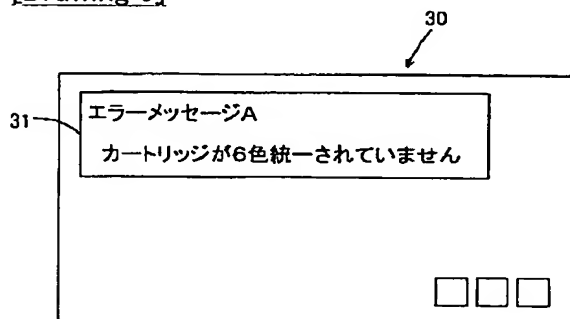
[Drawing 4]



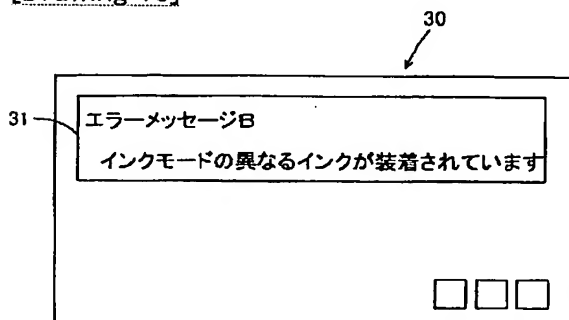
[Drawing 5]



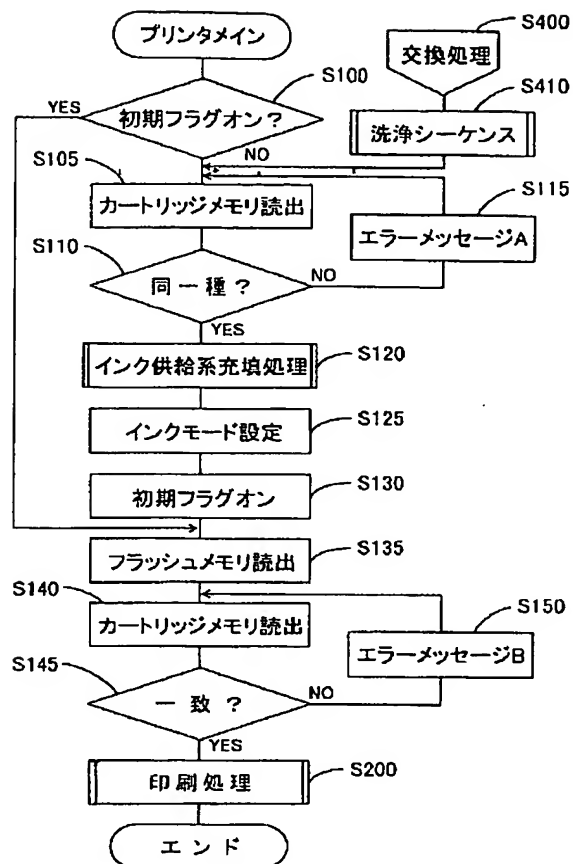
[Drawing 9]



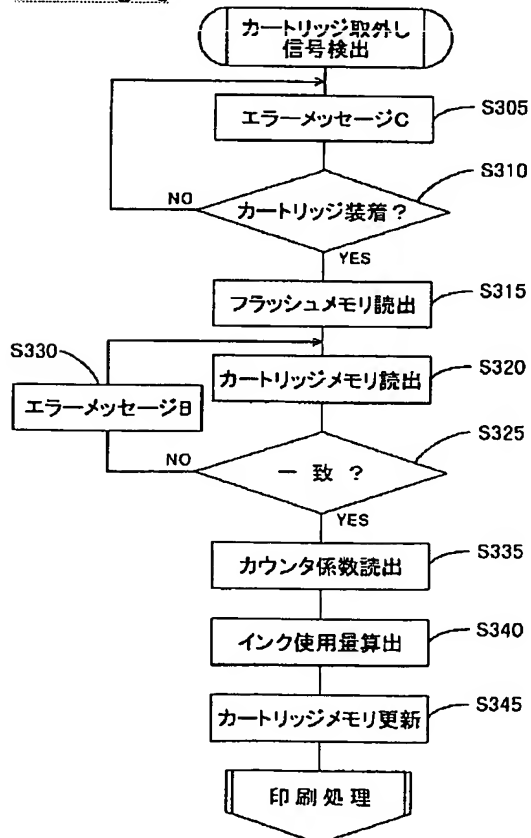
[Drawing 10]



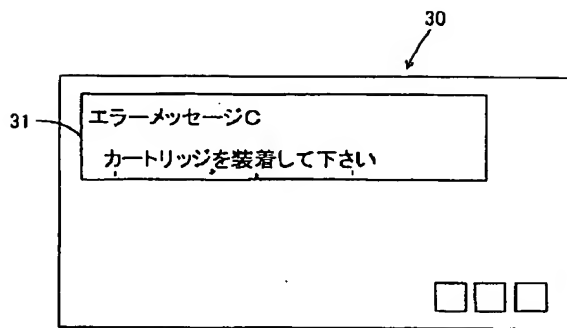
[Drawing 6]



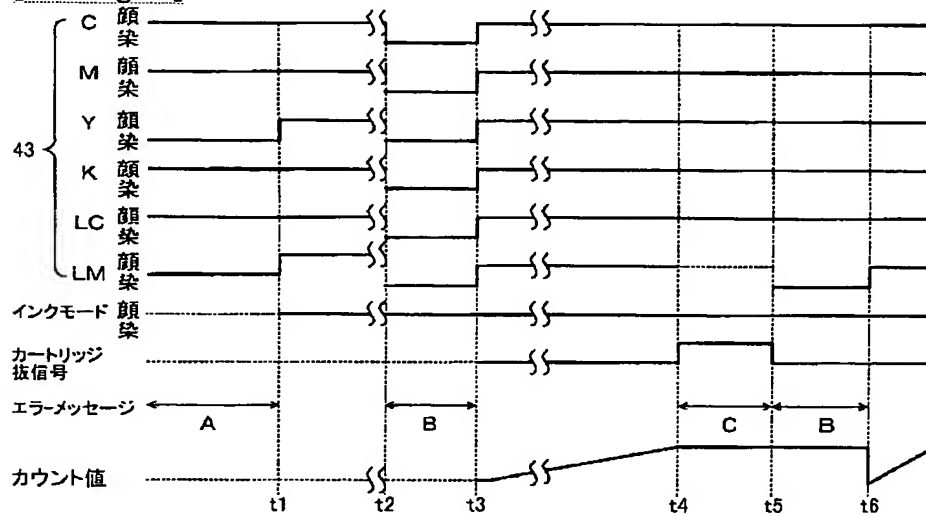
[Drawing 8]



[Drawing 11]



[Drawing 12]



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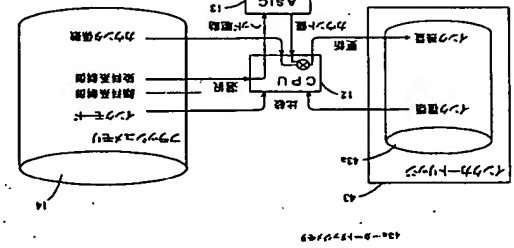
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(54) 【発明の名称】 プリント制御装置、プリント制御方法およびプリント制御プログラムを記録した媒体
最終頁に続く



(57) 【要約】
【課題】 インクカートリッジの交換によってインクの種類を変更可なプリンタにおいて、異系統のインクが混合すると印刷品質が損なわれる。また、インクの残量を適正に判定することができなかった。
【解決手段】 インクカートリッジに搭載された不揮発性メモリにインクの種類やインクの残量を記憶し、インク供給系にインクを供給したそのインクの種類を記憶し、印刷時に同記憶したインクの種類と上配不揮発性メモリに記憶されたインクの種類を比較する。この結果、両者が一致するときに当該インクの種類に適合した印刷制御を実行することができる。また、ヘッド駆動に際してインク使用量を算出し、インクの残量を更新するので適正なインク残量を判定することができる。

【特許請求の範囲】
【請求項1】 交換可能なインクカートリッジに充填されたインクをヘッドに供給しながら印刷を行うプリンタを制御するプリンタ制御装置であって、
記憶内容を更新可能であって上配インクカートリッジに搭載されるときに当該インクカートリッジに充填されるインクの種類を記憶する不揮発性メモリと、
上配インクカートリッジを着脱可能であるとともに同インクカートリッジ装着時に上配不揮発性メモリからのデータ送受信を可能にするインクカートリッジへのインク供給系に供給されているインクの種類を記憶する供給インク記憶手段と、
上配印刷に際して上配ヘッドの駆動に必要な印刷条件を上配インクカートリッジに充填されるインクの種類別に記憶する印刷条件記憶手段と、
上配不揮発性メモリに記憶されたインクの種類と上配供給インク記憶手段に記憶されたインクの種類とを比較して、両者のインクの種類が一致する状態で上配印刷条件記憶手段に記憶された印刷条件に基づいてヘッドの駆動を制御しつつ適宜所定の情報を上配不揮発性メモリに書き込むヘッド駆動制御手段とを具備することを特徴とするプリンタ制御装置。

【請求項2】 上記請求項1に記載のプリンタ制御装置において、
上配不揮発性メモリは、インクカートリッジに充填されるインクの残量を記憶しており、上配ヘッド駆動制御手段は、上配ヘッドの駆動に伴って消費するインクの使用量を算出するとともに当該算出に基づいて上配不揮発性メモリに記憶されたインクの残量を更新することを特徴とするプリンタ制御装置。

【請求項3】 上記請求項2に記載のプリンタ制御装置において、
上配ヘッド駆動制御手段は、上配ヘッドの駆動とともに増加するカウンタに基づいてインク使用量を算出することを特徴とするプリンタ制御装置。

【請求項4】 上記請求項3に記載のプリンタ制御装置において、
上配印刷条件記憶手段は、上配カウンタのカウント値に乗ずることによってインク使用量を算出するためのインク使用量算出係数を記憶することを特徴とするプリンタ制御装置。

【請求項5】 上記請求項1～請求項4のいずれかに記載のプリンタ制御装置において、
上配印刷条件記憶手段は、上配ヘッドを駆動する際に増加する駆動電圧パターンを記憶することを特徴とするプリンタ制御装置。

【請求項6】 上記請求項1～請求項5のいずれかに記載のプリンタ制御装置において、
上配印刷条件記憶手段は、上配ヘッドにおけるインク供給系に記憶されたインクの種類を記憶することを特徴とするプリンタ制御装置。

【請求項7】 上記請求項1～請求項6のいずれかに記載のプリンタ制御装置において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御装置。

【請求項8】 上記請求項1～請求項7のいずれかに記載のプリンタ制御装置において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御装置。

【請求項9】 上記請求項1～請求項8のいずれかに記載のプリンタ制御装置において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御装置。

【請求項10】 上記請求項1～請求項9のいずれかに記載のプリンタ制御装置において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御装置。

【請求項11】 記憶内容を更新可能であって充填されるインクの種類を記憶する不揮発性メモリを搭載するとともに装着部に着脱することによって交換可能なインクカートリッジに充填されたインクをヘッドに供給しながら印刷を行うプリンタを制御するプリンタ制御方法であって、
上配インクカートリッジから上配ヘッドへのインク供給系に供給されているインクの種類を記憶する供給インク記憶手段と、
上配印刷に際して上配ヘッドの駆動に必要な印刷条件を上配インクカートリッジに充填されるインクの種類別に記憶する印刷条件記憶手段と、
上配不揮発性メモリに記憶されたインクの種類と上配供給インク記憶手段に記憶されたインクの種類とを比較して、両者のインクの種類が一致する状態で上配印刷条件記憶手段に記憶された印刷条件に基づいてヘッドの駆動を制御しつつ適宜所定の情報を上配不揮発性メモリに書き込むヘッド駆動制御手段とを具備することを特徴とするプリンタ制御方法。

【請求項12】 上記請求項11に記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドを駆動する際に増加する駆動電圧パターンを記憶することを特徴とするプリンタ制御方法。

【請求項13】 上記請求項1～請求項12のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドにおけるインク供給系に記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項14】 上記請求項1～請求項13のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項15】 上記請求項1～請求項14のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項16】 上記請求項1～請求項15のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドにおけるインク供給系に記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

給系のクリーニングに必要な駆動条件を記憶することを特徴とするプリンタ制御装置。

【請求項7】 上記請求項1～請求項6のいずれかに記載のプリンタ制御装置において、
上配印刷条件記憶手段は、上配ヘッドにおけるフラッシングに必要な駆動条件を記憶することを特徴とするプリンタ制御装置。

【請求項8】 上記請求項1～請求項7のいずれかに記載のプリンタ制御装置において、
上配不揮発性メモリと供給インク記憶手段と印刷条件記憶手段とのいずれかまたは組み合わせは、記憶情報の書込と消去とを禁止するよう設定可能であることを特徴とするプリンタ制御装置。

【請求項9】 上記請求項1～請求項8のいずれかに記載のプリンタ制御装置において、
上配ヘッド駆動制御手段は、上配インクカートリッジの交換時に上配インクの種類の比較を実行することを特徴とするプリンタ制御装置。

【請求項10】 上記請求項1～請求項9のいずれかに記載のプリンタ制御装置において、
上配ヘッド駆動制御手段は、上配インク供給系にインクを供給した後に上配供給インク記憶手段に記憶されるインクの種類を当該供給したインクの種類の種類で更新することを特徴とするプリンタ制御装置。

【請求項11】 記憶内容を更新可能であって充填されるインクの種類を記憶する不揮発性メモリを搭載するとともに装着部に着脱することによって交換可能なインクカートリッジに充填されたインクをヘッドに供給しながら印刷を行うプリンタを制御するプリンタ制御方法であって、
上配インクカートリッジから上配ヘッドへのインク供給系に供給されているインクの種類を記憶する供給インク記憶手段と、
上配印刷に際して上配ヘッドの駆動に必要な印刷条件を上配インクカートリッジに充填されるインクの種類別に記憶する印刷条件記憶手段と、
上配不揮発性メモリに記憶されたインクの種類と上配供給インク記憶手段に記憶されたインクの種類とを比較して、両者のインクの種類が一致する状態で上配印刷条件記憶手段に記憶された印刷条件に基づいてヘッドの駆動を制御しつつ適宜所定の情報を上配不揮発性メモリに書き込むヘッド駆動制御手段とを具備することを特徴とするプリンタ制御方法。

【請求項12】 上記請求項11に記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドを駆動する際に増加する駆動電圧パターンを記憶することを特徴とするプリンタ制御方法。

【請求項13】 上記請求項1～請求項12のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドにおけるインク供給系に記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項14】 上記請求項1～請求項13のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項15】 上記請求項1～請求項14のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドにおけるインク供給系に記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項16】 上記請求項1～請求項15のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項17】 上記請求項1～請求項16のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項18】 上記請求項1～請求項17のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項19】 上記請求項1～請求項18のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドにおけるインク供給系に記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項20】 上記請求項1～請求項19のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項21】 上記請求項1～請求項20のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドに記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

【請求項22】 上記請求項1～請求項21のいずれかに記載のプリンタ制御方法において、
上配印刷条件記憶手段は、上配ヘッドにおけるインク供給系に記憶されたインクの種類を記憶することを特徴とするプリンタ制御方法。

たときには、上記コントロールIC41aがインカートリッジ43の取り外しを示す信号を出力し、インカートリッジ43が装着されたときには、上記コントロールIC41aがインカートリッジ43の装着を示す信号を出力するようになっている。

【0042】上記メイン基板11上には、さらに所定の通信I/O15が備えられており、同通信I/O15を介してインクジェットプリンタ10の外部のコンピュータ50と接続される。コンピュータ50においては同インクジェットプリンタ10用のドライバがインストールされており、利用者がデジタル写真画像データの印刷を実行するとドライバが所定のデータ変換等を行うとともに印刷データと印刷指示とをインクジェットプリンタ10に送信し、上記CPU12が印刷指示に従って印刷データを印刷する。

【0043】図3は、フラッシュメモリ14のメモリアドレスの要部を示している。本実施形態にかかるインクジェットプリンタ10は、染料系のインクと顔料系のインクの双方が使用可能なことから、フラッシュメモリ14においては両系統のインクに対して適切な制御を行うためにインクの系統別のパラメータ等が記憶されている。具体的には、インク供給系すなわら上記チューブ2a内に所定のインクを充填する初期充填が行われたかを示す初期フラグと、現在使用中のインクの種類を示すインクモードとが記憶される。

【0044】さらに、インクの種類別の駆動パラメータである印刷条件が染料系のインクと染料系のインクのそれぞれに対して記憶されている。これらのデータはハードウェア的なデータの固定と消去とを禁止可能なプロセクトブロックに記憶されている。このように、本実施形態においてはフラッシュメモリ14が上記供給インク配管手段と印刷条件記憶手段とを構成する。印刷条件にはカウント係数と駆動電圧とクリーニング条件とフラッシング条件とがあり、カウント係数は上記ASIC13におけるカウント値に算出される係数であり、当該算出によってドット数という統一されたカウントから染料系、染料系双方のインク使用量を適切に算出する。また、染料系のインクと染料系のインクとはインクの特性すなわら粘度等が異なるので、インクの吐出やクリーニング、フラッシング等、同様動作をさせるとしてもヘッド22の具体的な動作は異なっている。

【0045】そこで、各系統毎に駆動電圧とクリーニング条件とフラッシング条件とが記憶されており、CPU12はかかるデータを読み出して上記ASIC13に指示し、ヘッド駆動部16が当該指示に従って所定のヘッド駆動を制御する。例えば、駆動電圧は印刷時に上記ヘッド駆動部16によって生成する印加電圧のパターンを示すデータであり、図4に示すように異なるパターンで電圧を加える。

【0046】すなわち、印刷条件としての駆動電圧はイメージデータを記載したルックアップテーブルからなり、CPU12が同ルックアップデータを参照してASIC13に指示すると、ASIC13は当該イメージデータを交換してヘッド駆動部16に印加電圧データを出力する。ヘッド駆動部16は前記印加電圧データによって電圧の時間的変化であるパルスを発生し、パルスは主に上昇パルスと下降パルスとがあり、上昇パルス中には印加電圧が上昇するとともに上記ヒンジ素子が駆動され、インク室の容積が増加する。また、下降パルス中には印加電圧が下降するとともに上記ヒンジ素子が駆動され、インク室の容積が増加する。従って、これらのパルスの幅を調整することによって上記ヘッド駆動部16が生成する電圧は図4に示すような略台形状になり、かかる電圧でインクの吐出が制御される。

【0047】図4の上図の電圧パターンは染料系のものであり、当該染料系のインクではまず期間t1において下降パルスを入力してインク室の容積を増加させる。そして、期間t12でパルスの入力を停止してヒンジ素子を保持することによりインクの状態を落つかせ、その後、期間t13では上昇パルスを入力してインク室の容積を減少させ、インクを吐出させる。さらに、期間t14でパルスの入力を停止してこの状態を保持し、期間t15で下降パルスを入力して吐出インクを分析する。この後、期間t16でパルスの入力を停止してこの状態を一定期間保持するとともにキャリッジを駆動して次のドットに対するインク吐出シーケンスを行う。

【0048】これに対して、図4の下図の電圧パターンは染料系のものであり、当該染料系のインクではまず期間t21において上昇パルスを入力してインク室の容積を増加させる。そして、期間t22でパルスの入力を停止してヒンジ素子を保持することによりインクの状態を落つかせ、その後、期間t23では下降パルスを入力してインク室の容積を増加させ、期間t24でこの状態を保持してインクの状態を落つかせる。さらに、期間t25では再び上昇パルスを入力してインク室の容積を減少させ、インクを吐出させる。この後には、期間t26でこの状態を保持し、期間t27で下降パルスを入力して吐出インクを分析し、期間t28でこの状態を保持してドットの吐出シーケンスを終了する。

【0049】このように、染料系のインクと染料系のインクとではインク特性の差異からヘッド駆動パターンも異なっており、それぞれの系統に適した制御を行うためにインク系統別に駆動電圧が保持されており、インクの種類に応じて適宜参照される。この印刷時の駆動電圧の他に、ヘッド駆動部16はクリーニングやフラッシングのための電圧も生成可能になっており、ヘッド22は当該電圧によって印刷とは関係のないインクの吐出を行なうことができる。すなわち、ヘッド22の往復運動の一端の電圧の下にはポンプユニット24が配設されており、

同ポンプユニットは墨まで搬送されたヘッド22に対して負圧を作用させることによって増粘インクの吸引やチューブ22aに対する初期充填処理を実行することができ、

【0050】ヘッド駆動部16は図示しないケーブルを介してポンプユニット24に対して所定の駆動電圧を印加するようになっている。印刷中に一定時間が経過するとインクの種類に応じたフラッシング条件が参照され、ヘッド22に所定のインク吐出を実行させるし、上記操作ボタン32における所定の操作に応じてインク種類に応じたクリーニング条件を参照するとともにヘッド22に所定のクリーニング動作を実行できるようにになっている。さらに、インカートリッジの交換後等にはチューブ22aに対する初期充填処理を実行する。

【0051】図5は、上記構成において本発明にかかるプリンタ制御装置が実施する制御の概略を示した概略図である。プリンタ制御装置において主制御は上記CPU12が担っており、インクの種類に応じた処理を行うため、CPU12は上記インカートリッジメモリ43aに記憶されたインクの種類とフラッシュメモリ14に記憶されたインクモードとを比較して、インクモードとして記憶されている現在使用中すなわらインク供給系にインクが充填されているインクの種類とインカートリッジ43に充填されているインクの種類とを一致させた状態で印刷を行う。

【0052】また、これらの比較によって一致していることとされたインクの種類に適合した条件でヘッド22を駆動するためフラッシュメモリ14を参照し、現在使用中のインクの種類に合わせて染料系制御あるいは染料系制御のパラメータを使用してヘッド22を駆動する。さらに、ASIC13にてカウントされているドット数にインクの種類に応じたカウント係数を乗じてインクの使用量を算出するとともに、当該使用量を上記インカートリッジメモリ43aのインク残量から減じるようにして更新することにより、染料系インクであっても染料系インクであってもインク残量を正確に把握していく。このように、本実施形態においてはCPU12とASIC13とヘッド駆動部16とコントロールIC41aとが上記ヘッド駆動制御手段を構成する。

【0053】図6～8は以上のような制御を含めてインクジェットプリンタ10でCPU12が実行する処理のフローチャートを示している。図6は、インクジェットプリンタ10の起動後から実行される処理であり、ステップ100ではCPU12がフラッシュメモリ14を参照し、上記初期フラグがオンであるか否かを判断する。同ステップ100にて初期フラグがオンであると判断されないときには、上記チューブ22a等のインク供給系にインクが充填されていないとして、当該チューブ22a内にインクを充填するための処理を行う。

【0054】このとき、ステップS105においてCPU

U12は上記コントロールIC41aと通信を行い、同コントロールIC41aにインカートリッジメモリ43aのインク種類を読み出させ、若くはインクの種類を把握する。ステップS110ではこの読み出したインクの種類が六色とも同一の種類であるか否かを判断し、同一の種類であると判断されなければステップS115にて、上記パネル1/O33を介してパネル部30を制御し、液晶表示部31に図9に示すエラーメッセージAを表示させる。

【0055】エラーメッセージAは「カートリッジが6色統一されていません」というメッセージであり、当該メッセージを表示した状態で利用者が間違えて挿入したインカートリッジ43を適正なものに取り替えることを促す。ステップS110にてインクの種類が六色とも同一の種類であると判断されたときには、ステップS120にてインク供給系に対するインクの充填処理を実行する。当該充填処理はインク供給系にインクを充填させる特別なシーケンスであり、かかるシーケンスが実行された後はインカートリッジ内のインクがインク供給系に充填され、ヘッド22のインク室内にもインクが充填される。従って、この状態でヘッド22内のヒンジ素子を駆動するとヘッド22のノズルからインクが吐出される。

【0056】この充填処理の後には、ステップS125にて上記フラッシュメモリ14にアクセスして上記充填したインクの種類をインクモードとして設定する。さらに、ステップS130にて上記フラッシュメモリ14にアクセスして上記初期フラグをオンにする。このようなフラグがオンであると同ステップS100にて初期充填処理を行った場合と上記ステップS100にて初期フラグがオンであると同ステップS100にて初期充填処理を行った場合とを区別するとともに、ステップS140にて上記コントロールIC41aにインカートリッジメモリ43aのインク種類を読み出させ、装着されているインクカートリッジ43に充填されたインクの種類を把握する。

【0057】そして、ステップS145にてインカートリッジ43に充填されたインクの種類とフラッシュメモリ14に記憶されたインクモードとが一致しているか否かを判断する。ステップS145にて両者が一致しているか否かを判断したときはステップS200にて印刷処理を実行する。ステップS145にて両者が一致しているか否かを判断したときはステップS150にて上記パネル1/O33を介してパネル部30を制御し、液晶表示部31に図10に示すエラーメッセージBを表示させる。

【0058】エラーメッセージBは「インクモードの異なるインクが装着されています」というメッセージであり、当該メッセージを表示した状態で利用者が間違えて

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ステップS305にて液晶表示体31上にエラーメッセージCを表示させ、利用者が同エラーメッセージCを根拠することによってインクカートリッジ43を装着すると促す。利用者がインクカートリッジ43を装着するとステップS310の判断を経てステップS315以降の処理を実行するが、誤って時刻t5にて他のインクカートリッジ43と異なる染料系のインクが充填されたインクカートリッジ43を装着した場合には、ステップS315～ステップS330の処理によってさらにエラーメッセージBが表示される。

【0077】利用者が当該エラーメッセージを視認することによって時刻t6でインクカートリッジ43を染料系インクが充填された適切なカートリッジに交換すると、ステップS325の判断を経てステップS335にてフラッシュメモリ14にアクセスし、染料系のカウンタ係数を読み出す。そして、ステップS340にて上記時刻t4の時点までカウントしていたカウンタ値に当該カウンタ係数を乗じることによってインク使用量を算出し、ステップS345にて上記コントロールIC41aを介してカートリッジメモリ43aを更新する。すなわち、印刷の途中でインクカートリッジ43が取り外されたとしても、それまでのカウンタ値が保持されたとともに再び適正なインクカートリッジ43を装着したときにインク残量が更新されるので、カートリッジメモリ43aに記憶されるインク残量が適正なものとなる。

【0078】このように、本発明においては、インクカートリッジに搭載された不揮発性メモリにインクの履歴やインクの残量を記憶し、印刷時に記憶したインクの履歴と上記不揮発性メモリに記憶されたインクの履歴とを比較する。この結果、両者が一致するときに当該インクの履歴を適合した印刷制御を実行することができ、インクの混合を防止することができる。また、ヘッド駆動に応じてインク使用量を算出し、インクの残量を更新するので適正なインク残量を判定することができ

る。

【図面の簡単な説明】

【図1】インクジェットプリンタの内部構成を示す概略斜視図である。

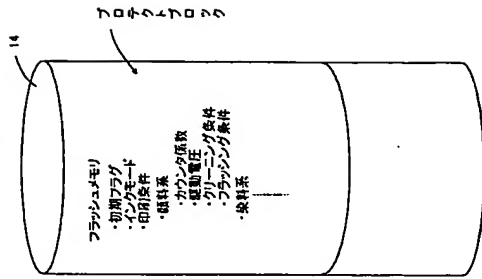
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- 【図2】インクジェットプリンタのブロック図である。
- 【図3】フラッシュメモリのメモリマップの要部を示す図である。
- 【図4】ヘッド駆動部にて生成する印加電圧のパターンを示す図である。
- 【図5】プリンタ制御装置が実施する制御の概略を示した概略図である。
- 【図6】CPUが実行する処理のフローチャートである。
- 【図7】CPUが実行する処理のフローチャートである。
- 【図8】CPUが実行する処理のフローチャートである。
- 【図9】エラーメッセージの表示例を示す図である。
- 【図10】エラーメッセージの表示例を示す図である。
- 【図11】エラーメッセージの表示例を示す図である。
- 【図12】各部の動作を示すタイミングチャートである。

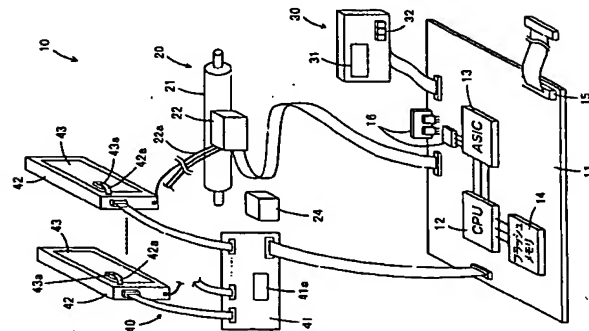
【符号の説明】

- 10...インクジェットプリンタ
- 11...メイン基板
- 12...CPU
- 13...ASIC
- 14...フラッシュメモリ
- 16...ヘッド駆動部
- 20...印刷部
- 21...ローラ
- 22...ヘッド
- 22a...チューブ
- 30...パネル部
- 31...液晶表示体
- 32...操作ボタン
- 40...カートリッジ部
- 41...サブ基板
- 41a...コントロールIC
- 42...カートリッジホルダ
- 43...インクカートリッジ
- 43a...カートリッジメモリ
- 50...パーソナルコンピュータ

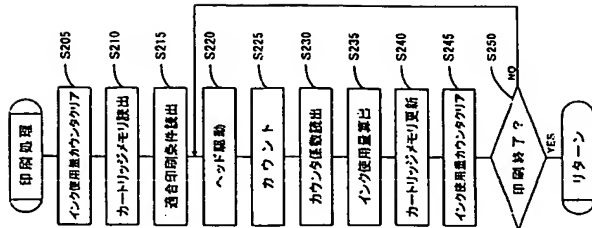
【図3】



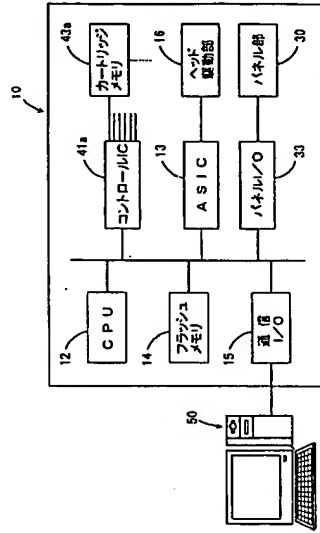
【図1】



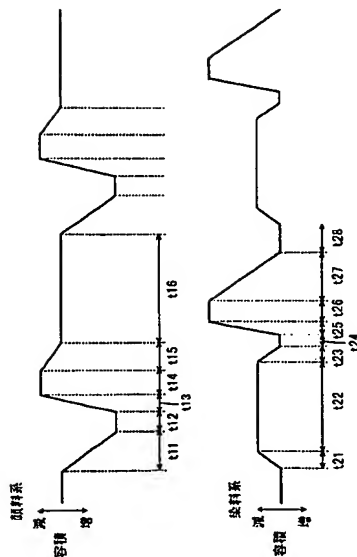
【図7】



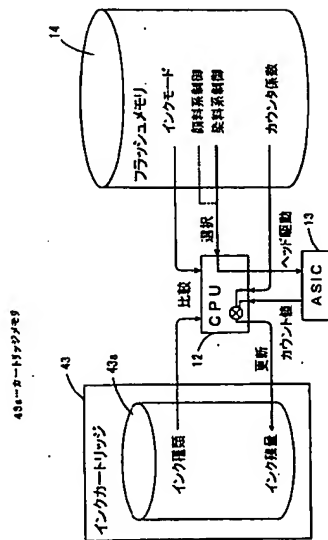
【図2】



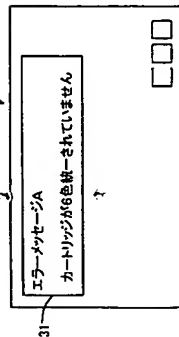
【図4】



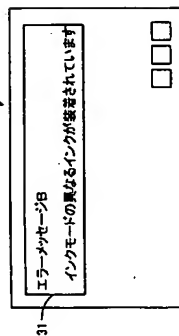
【図5】



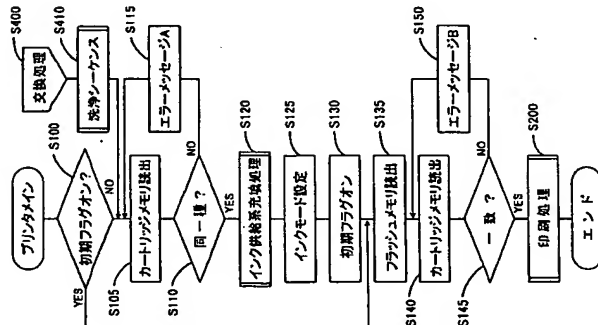
【図9】



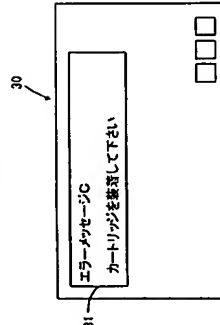
【図10】



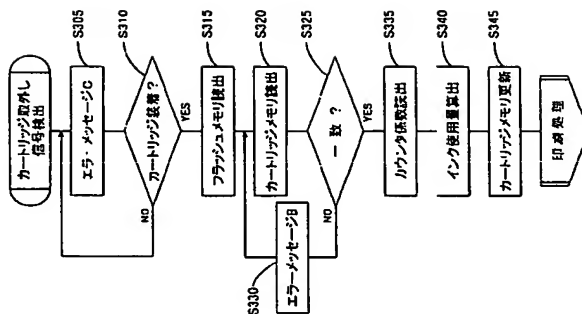
【図6】



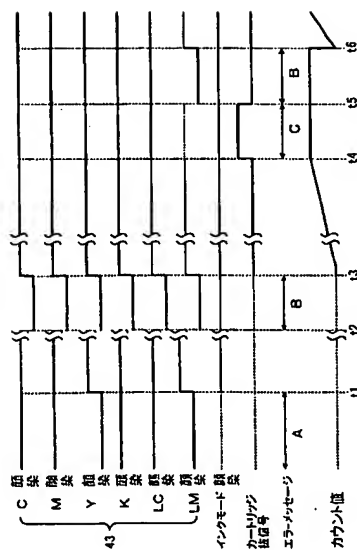
【図11】



【図8】



【図12】



フロントページの続き

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